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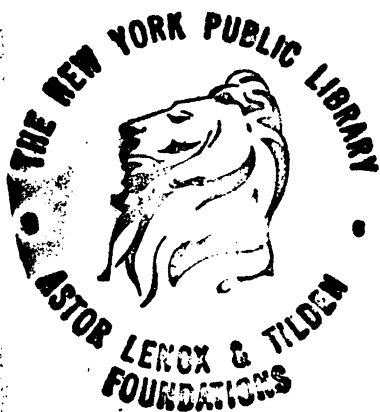
The GLADIOLUS

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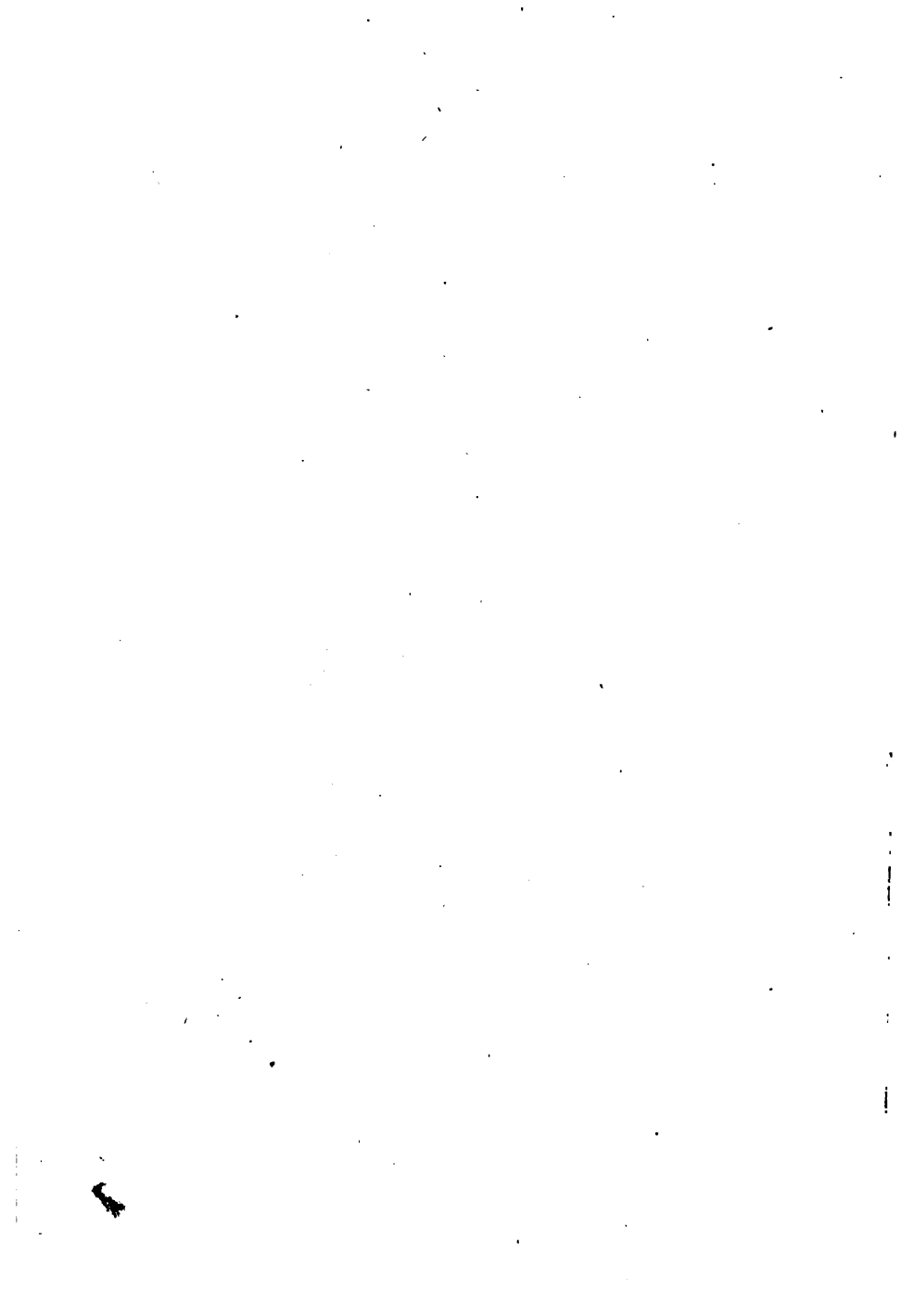
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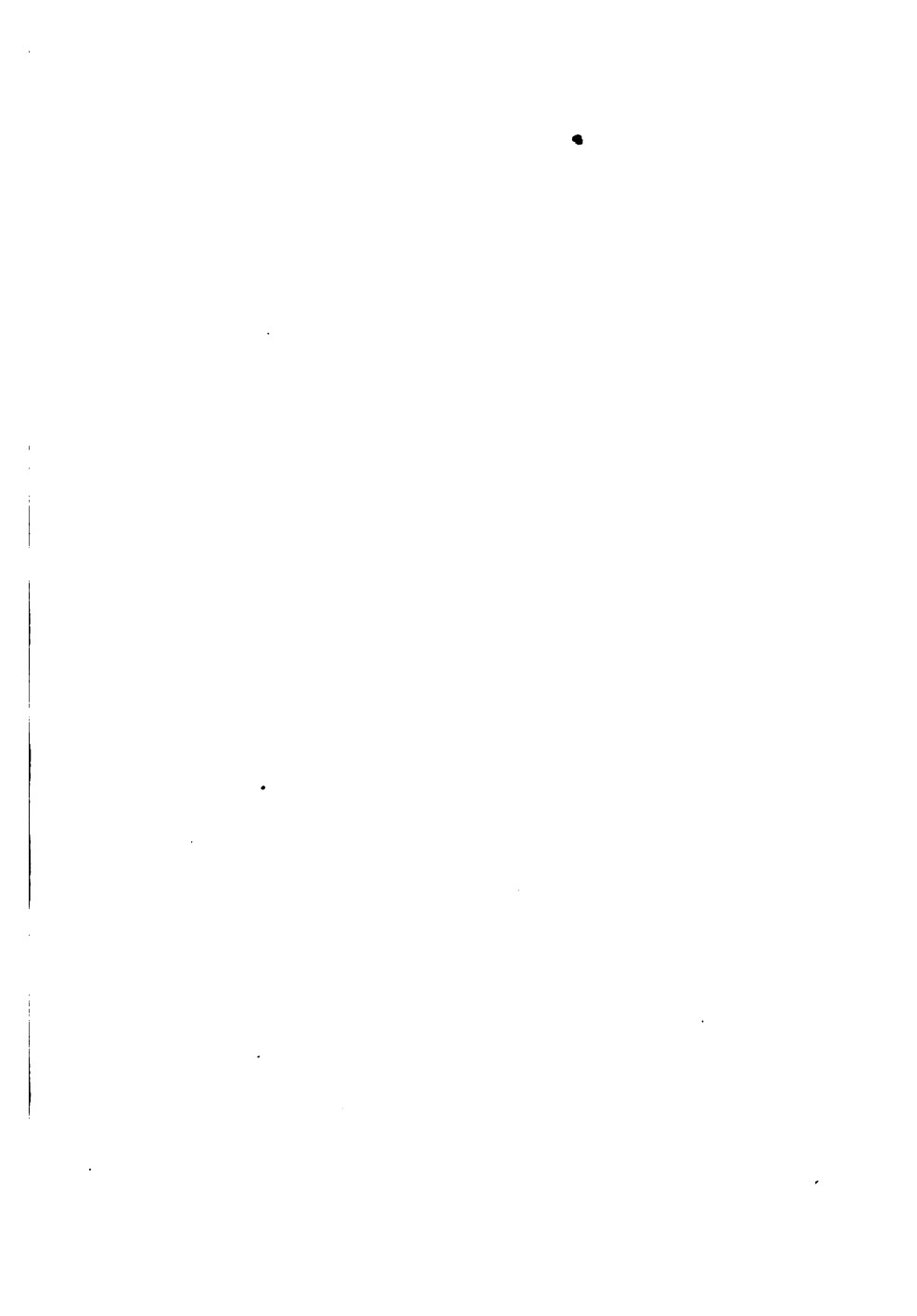


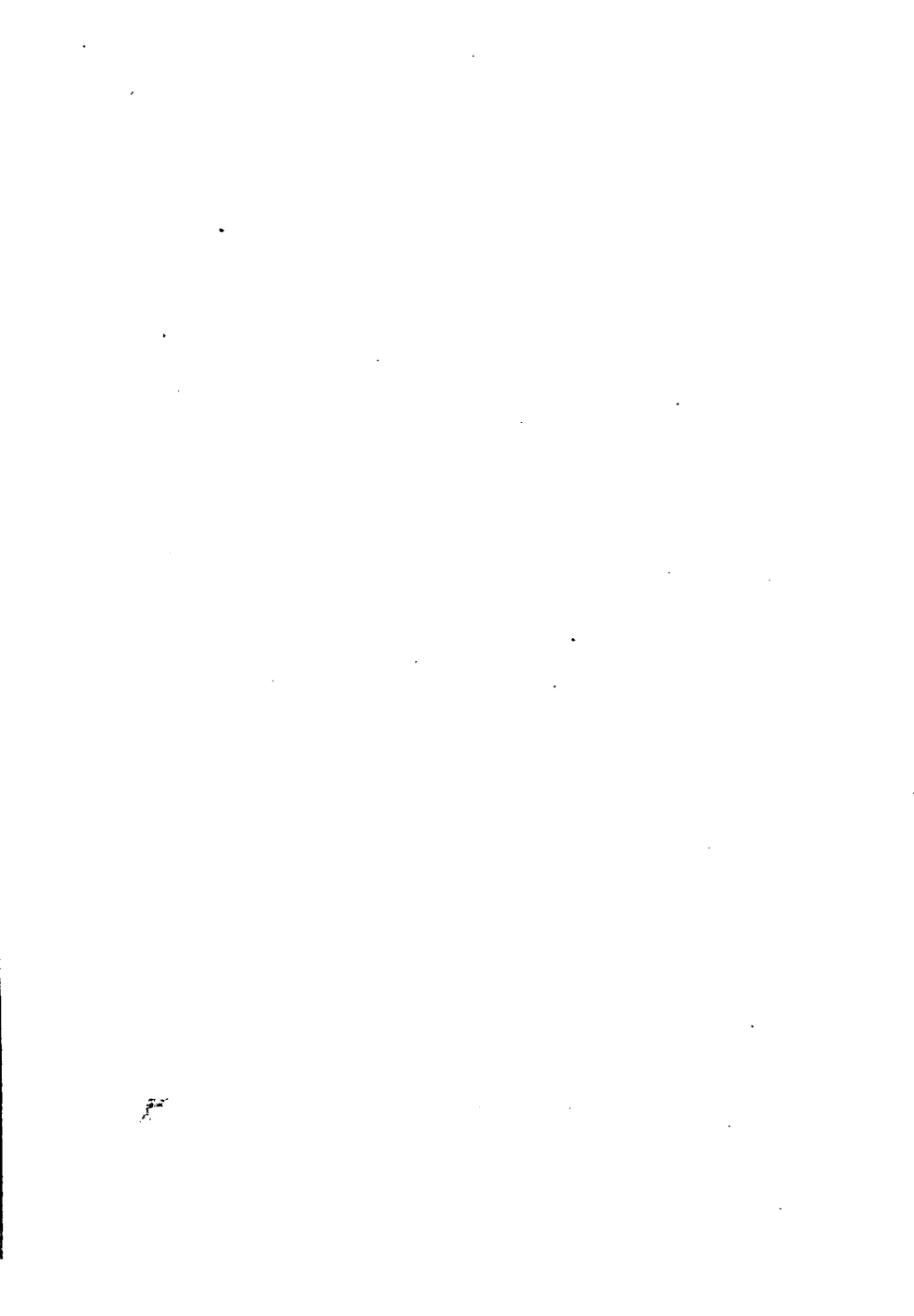
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I. S. HENDRICKSON
MRS. FRANCIS KING

VARIABILIS

THE GLADIOLUS

A PRACTICAL TREATISE ON THE CULTURE
OF THE GLADIOLUS, WITH NOTES
ON ITS HISTORY, STORAGE,
DISEASES, ETC.

By
MATTHEW CRAWFORD
With an appendix by
DR. W. VAN FLEET

CHICAGO and NEW YORK
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THE GLADIOLUS

PREFACE

This little book is written with a view to being of service to those inexperienced admirers of the gladiolus who wish to become better acquainted with its nature, and more familiar with the details of its cultivation. The language used is plain and easily understood, and the absence of technical terms, which might seem a fault to the skilled grower, will probably enhance the value of the work to the learner, for whom it is prepared. While it is written from the view-point of the commercial grower, the interests of the amateur are kept in mind throughout, and the instructions are as carefully adapted to the management of a little garden as to that of an extensive field.

A few words in regard to the pronunciation of "gladiolus" may be timely in the beginning of a treatise devoted exclusively to that subject. Fifty years ago the popular pronunciation was "glad-i-o'-lus," accent on the third syllable, but gradually a change crept in, as it was noticed that scholars said "gla-di'-o-lus," accent on the second syllable. Observing this, people began to consult dictionaries,

X and it was found that Webster and others gave "gla-di'-o-lus" only, and that all authorities placed this first, though a few permitted "glad-i-o'-lus," much to the satisfaction of those who found it hard to change. When "gla-di'-o-lus" is used, as it is almost universally, at the present time, the plural is "gla-di'-o-li," while the plural of "glad-i-o'-lus" may be "glad-i-o'-luses," though this is very seldom heard. Neither "gladiola" nor "gladiolia" is admissible. There are no such words. It is also incorrect to say "gladioli bulbs," which is equivalent to "roses bushes" or "peaches trees." "Gladiolus bulbs" is the proper expression.

— *The name, gladiolus, comes from the Latin, gladius, a sword, and was given to this plant on account of the sword-like shape of its leaves.

*Note: Authority is not lacking to show that Glad"-i-o'-lus, strongest accent on first syllable, is the best, as it certainly is the most agreeable pronunciation. This puts it in line with He"-li-an'-thus, and many other four syllabled words used in botany. Glad"-i-o'-luses as the plural is increasingly used in literature but not in speech.

THE GLADIOLUS

CHAPTER I.

History and Development.

The gladiolus comes principally from South Africa, where about fifty species have been discovered. It is also a native of middle Africa, central and southern Europe, Persia, Caucasus, and the country around the eastern end of the Mediterranean. About forty additional species have been found in these localities, and one in Hampshire, England. These have been hybridized and crossed until they are so mixed that it is impossible for the ordinary grower to say what blood may have entered into a given variety,—nor does it matter. We are satisfied to know that this is one of the most beautiful of our summer-blooming flowers, and that it is so easily grown as to be within the reach of almost anyone who cares to have it.

Its Development.

The history of the evolution of the gladiolus, from the original wild species to the splendid revelations of the present day, though extremely interesting, is rather uncertain, and lacking in details. Even

authorities disagree, and it is not worth while to touch upon disputed points, though a few accepted facts may be of value to the learner.

The Encyclopædia Britannica says that one variety was cultivated as far back as 1596, and another from 1629. Between 1750 and 1825 many new ones were added to those previously known. There are several general classes now before the public, of which the oldest is the Gandavensis. It is said that this was originated by Van Houtte, and was introduced in 1841. Belgium is credited with the honor of being its native country. Referring again to the Encyclopædia Britannica, we find that the coming of the Gandavensis made the gladiolus a general favorite in gardens, and that "since that time varieties have been greatly multiplied in number, increased in size and quality, as well as marvelously varied in color and marking, so that now they have become exceedingly popular."

The Gandavensis has a substantial stem, capable of taking up water freely, and probably owing to this fact opens many flowers at once. These are generally of good size and substance, and of handsome form. In most cases they are arranged upon the stem in two rows that face the same way which makes them very showy and attractive.

Some years after the introduction of the Gandavensis, Victor Lemoine, of Nancy, France, brought out a new hybrid to which he gave his own name,

Lemoinei. It has a slender, graceful stem, which seems unable to take up water rapidly, and consequently only a few of its flowers open at once. These are smaller than those of the Gandavensis, and more arched in form. Many of them, perhaps the majority, have rich velvety blotches on some or all of the petals, darker in color than the petals themselves, thus giving the flowers a very striking appearance. The well known Marie Lemoine was one of the earliest varieties of this new hybrid, and its dark velvet spots on a ground of pale yellow slightly tinged with green, have caused some to call it the "pansy gladiolus."

Lemoine's next achievement was the Nanceianus, probably from Nancy, his home. Its flowers are quite different from those of Gandavensis or Lemoinei, being larger than either, very wide, and marked with peculiar mottlings, or fine, short, parallel strokes of some contrasting color.

Next came Leichtlinii, afterwards called Childsii, originated by Max Leichtlin and purchased by V. H. Hallock & Son, who worked ten years to improve it and then sold it to John Lewis Childs, who changed its name. This transfer was made in 1892. Childsii is from nearly the same cross as Nanceianus and quite similar to it. Both plant and flower are large, and the latter is very showy, but the petals incline to lack substance, and consequently can not endure hardship. At first the Childsii ran too

much to reds, but it has since been improved in that respect.

The next distinctive attraction was the "New Blue," another of Lemoine's productions. There has been much effort expended in trying to originate a blue gladiolus, and this, although not a pure and perfect blue, is the nearest approach to it yet made, and may prove to be the foundation for complete success in the future.

In 1908 the *Primulinus*, a new species from South Africa, was introduced by J. M. Thorburn & Company. It is small and inconspicuous, but yellow, and is said to transmit its color to all its seedlings. It may be the means of supplying what has been long striven for,—a good yellow.

The gladiolus of my earliest recollection, which was found in some gardens about the middle of the nineteenth century, was dull red mingled with greenish yellow, appearing red at a distance. The flowers were small and pinched-looking, with pointed petals, and were scattered at regular intervals along one side of the leaning stem. The next that I remember was a great improvement upon this. It made an upright, sturdy spike, with two rows of large, well formed, melon-colored flowers, set close together on the stem, but the rows faced in opposite directions. After this, new varieties came fast, and rapid improvement was made. Among these earlier sorts was one called *Brenchleyensis*, conspicuous for its color, a most

vivid and intense red. It had some faults, and gradually lost popularity until it was scarcely heard of, but now, after an interval of two or three decades, it is again making its way to the front, and is listed in catalogues at good prices.

Popularity of the *Gladiolus*.

This flower is already very popular, and is becoming more and more of a favorite every year. It possesses a combination of characteristics that commend it to all flower lovers. It is easily grown, and may be had in bloom about four months in the year without the aid of glass. The blossoms are beautiful in form, and include a wonderful range of colors, with almost innumerable combinations. Its general habit of bearing two rows of flowers facing the same way makes it easy to arrange so as to show all to the best advantage. It has a capacity for taking up water which enables it to go on blooming to the very tip of the spike after being cut, lasting a week in the hottest weather, and twice that time when cooler. The ease with which the stem can be divested of its faded flowers, leaving it as fresh as though just brought from the garden, is also a great recommendation. Some years ago, I expressed a quantity of the spikes from Cuyahoga Falls, Ohio, to Butte, Montana. They were in bud when started, and when they arrived, had bloomed half way up the stalks, and the lower flowers had faded. These were taken off, the

stems placed in water, and the buds went on opening to the last, unaffected by the journey of two thousand miles.

Another merit of the gladiolus, which might not seem a merit at first thought, is its lack of perfume. An agreeable fragrance is desirable in flowers that are used in moderate quantities, but in banks and masses, as this is often arranged, a sweet odor would be overpowering.

Its Uses.

For decorative purposes the gladiolus is fast becoming indispensable. The demand has grown from tens to hundreds within the last few years, and probably it will increase from hundreds to thousands in the near future, for it is a flower for all people and all places. It is suitable for the home, and from midsummer until November is a constant dependence. For stores and offices its bright and lasting bloom makes it very desirable. It is in great demand for ornamenting churches, halls, schoolrooms, and in fact all places where people come together for almost any purpose. It is popular for weddings, and great quantities are often used on such occasions, a single order sometimes calling for thousands of spikes. Last of all, it is seen in the house of mourning, and at the graves of the dead, where its sweet cheerfulness seems to speak a message of comfort to the living.



CHAS. L. HUTCHINSON



AMERICA

CHAPTER II.

Habits of Growth.

The gladiolus is a bulbous plant that grows only in the warm season of the year. It may be grown from bulbs, bulblets, or seeds. Amateurs have to do mainly with bulbs, as their chief object is to produce flowers. The bulb contains the food for the nourishment of the young plant until it has leaves, when it commences to form a new bulb close above the old one, which latter gradually shrivels and dies, its work being done. Meanwhile, the young plant, having roots and leaves of its own, continues to grow and build up the new bulb.

When far enough advanced, the flower spike starts up through the middle of the foliage and makes its appearance above the upper leaf. From the time the spike comes in sight, the plant seems to devote the most of its energy to developing the flowers, and the seed which follows. When the latter is allowed to ripen, the bulb is smaller than it otherwise would have been, and not only this, it is vertically thin, having been partially starved by the diverting of the nourishment to ripen the seed. On the other hand, if the spike is removed when the first flower opens, the bulb will grow larger and thicker.

Other things being equal, a bulb is valuable according to its vertical diameter. The most perfect ones are obtained by planting small ones, just below the blooming size. Not being able to send up flower spikes, their vitality goes to the production of new bulbs, and these are conical, or nearly round, which is the ideal shape. Many florists insist upon this form when buying bulbs for forcing. They are known to the trade as virgin bulbs. As to the breadth of bulbs, the broader the better, other points being the same. One that is conical in shape, and three-fourths of an inch in horizontal diameter will probably produce as fine a spike of flowers as is possible to the variety, but it will yield only one, while bulbs of larger size may send up from two to six.

Bulblets are produced during the summer, on underground stems that come out from the base of the new bulbs. Each bulblet is enclosed in a hard shell, which is generally brown in color, though sometimes gray, slate, or black, and very rarely white.

Just here I will speak of the difference between bulblets and small bulbs, for there are some confused ideas abroad on this subject. Bulblets grow from the bottoms of bulbs, are usually attached by stems, and have hard shells. Bulbs grow from other bulbs, from bulblets, or from seeds, and have soft shells. They may be very tiny, no larger than apple seeds, but still they are bulbs.

Varieties differ widely in their ability to produce bulblets. The May and Augusta are exceedingly prolific, while the Shakespeare is just the opposite. A bulb too small to bloom will yield many times more bulblets than a large one of the same variety. Sometimes as many as two hundred bulblets have been found on a single bulb.

Corm and cormel are the correct botanical terms respectively for solid bulbs, like those of the gladiolus, and the small underground increase, but these names are rarely used in commercial horticulture.

CHAPTER III.

Soils and Preparation.

The gladiolus will grow on almost any soil, and do well with only a moderate chance. While it has its preferences, it readily adapts itself to circumstances, and makes the most of what it finds. Whether sand, clay, gravel, muck or loam, it will get a living out of them, though gravel is perhaps least desirable. The gladiolus withstands drouth very well, but likes plenty of moisture much better, and low land well drained is excellent for it. It ought not to be under water. Good farm land, suitable for corn or potatoes, answers its purpose very well, and it flourishes on green sward properly plowed and harrowed. The richest place in the garden suits it admirably, and it shows its appreciation of special favors by ready response in growth and bloom.

The ground should be plowed or spaded to a good depth, about the same as for potatoes, and harrowed or raked until it is thoroughly pulverized, not only on the surface, but down deep.

Fertilizers.

Any crop can be well fed with good stable manure properly applied, but this is sometimes out of reach. In such cases we must either resort to

commercial fertilizers or depend upon the plant food in the soil, which is seldom sufficient for any crop, especially one whose yield of profit may be greatly increased or diminished by the giving or withholding of nourishment. The gardener cannot afford to take any risks along this line. His crops are too valuable. The safe course is for him to assume that the land is poor, to consider the ground as simply a place of anchorage for the roots of plants, and a reservoir for plant food to be supplied; and then, to furnish the amount needed to produce the crop. Fortunately, most soils do, as a matter of fact, contain a fair supply of fertility, but very rarely as much as a crop can appropriate, and it is best to be on the safe side. The gladiolus is a sturdy grower, able to assimilate a generous supply of nutriment, and should be properly fed.

In regard to the use of stable manure as a fertilizer for this crop, almost any amount of it may be put on in the fall before planting, to be leached and subdued by the changes of winter, but it is hardly safe to spread it on the ground in the spring and plow it under, lest it come in contact with the bulbs and cause the growing crop to be scabby and unsalable. I have used for many years, and with most satisfactory results, a good potato phosphate. Any complete commercial fertilizer will answer the purpose. I once tried a ton of Peruvian guano, as

an experiment, but it did no better than the potato phosphate, which cost less.

Commercial fertilizer may be applied in various ways,—before planting or after, or in the furrows. From five hundred to one thousand pounds per acre, or even more, may be used, according to the previous condition of the land and the results desired. When used before planting, it is put on with a grain drill, or, if the area is small, is raked in by hand. It may be applied in the furrow in two ways; first, strew it along in the bottom and mix it with the soil by dragging a chain or a hoe over it, or by using the cultivator that made the drill. Then plant the bulbs, and cover properly. Second, after the drill is made and the bulbs are dropped, cover them with a little earth, say half the depth of the furrow, then put in the fertilizer by hand, and finish covering. This places it where the first good rain will wash its richness down to the roots. When applied after planting, it may be scattered by hand along the rows or over the bed. This plan produces good results, even on poor land, and the same may be said of the others.

CHAPTER IV.

Time to Plant.

Large blooming bulbs may be planted in April or May, or they may be held until June, or even July, if they can be kept from growing too much in storage. It is their natural instinct to send out roots and shoots in the spring, and when they do they should be planted soon. When one has a considerable quantity of flowering bulbs, it is easy to secure a long succession of bloom by planting at several different times. Good sized bulbs will bloom in about ninety days after planting. Smaller ones require a longer time. If all the blooming sizes of the same variety are planted at the same time, they will bloom in regular succession, the largest first and the smallest last. Small bulbs,—too small to bloom,—bulblets, and seed, should be planted early in order to have plenty of time to make their growth. About the first of April is a suitable time in the latitude of Northern Ohio. In a mild climate the bulbs may be left in the ground all winter, and the same might be done in the north if they could be covered securely enough to keep out the frost.

Planting.

After the land has been well prepared, furrows are made three feet apart and about six inches deep,

for large bulbs. The furrowing is done with the Planet Jr. cultivator, arranged with a large tooth behind, and two or four smaller ones in front, turned edgewise. They steady the cultivator and contribute towards the fining of the soil. Next, the bulbs are placed in the furrows, as far apart as their own diameter; that is, two-inch bulbs should be two inches apart, one-inch bulbs one inch, and so on down through all the blooming sizes. When bulbs are an inch or more in diameter, they are generally placed right side up, though this is not essential. However, when scattered along the furrow they can be put in position very quickly.

After they are placed, cover with the cultivator used in furrowing, taking off the small teeth in front and putting on the wings. By going once in each space, throwing the soil both ways, the bulbs are covered deeply enough to make quite prominent ridges over the rows, with furrows midway between. Very soon the weeds begin to show, and then a good harrowing is given, lengthwise of the rows, to kill the first crop. Next, just before the sprouts are ready to come in sight, they are gone over with the weeder. On small areas all this stirring is done with a steel rake. By this method the surface is kept free from weeds, and is also made fine and mellow for the young shoots to come through. If the work cannot be done at the right time, it is better to wait until the sprouts are up an inch or two, as they can then be stirred without fear of

injury, but when just coming up they are tender and easily bruised or broken.

When bulbs are planted in a small way, it is not customary to place them in rows. A better plan is to scatter them over the ground about as far apart as they are wanted, say six or eight inches each way, and put them in one at a time with a trowel or dibble, five or six inches below the surface. They are planted at this depth, in both garden and field, to prevent their blowing over when in bloom. Those that are from one-half to three-fourths of an inch in diameter should be covered with about four inches of soil.

For planting small stock, less than half an inch in diameter, the ground should be prepared as previously directed. The rows should be three feet apart if the cultivating is to be done with a horse; if by hand, eighteen inches. The furrows should be straight, and three inches in depth. The grower can now choose one of two methods of planting. He can sow the bulbs in the furrows, about twelve to the foot, or drop them in hills, four to six in a place, every twelve inches. In either case they can be covered with a cultivator, as before described, ridged up, and harrowed or raked afterwards, thus saving the first and most expensive weeding. When the bulbs have started sufficiently to make the rows visible, the cultivator can be used, and from that time forward the most of the work can be done

with a horse, turning a little earth up to the rows each time.

The hill method of planting takes more ground, but it has two distinct advantages over the drill method. First, the hoe can be used in the row between the hills, thus lightening the labor and expense of weeding; and second, in taking up the bulbs in the fall, each hill can be lifted out with a fork, and every bulblet saved. In growing stock that is especially valuable this is of great account.

Very few bulbs less than one-half inch in diameter will bloom, so all they need is a chance to grow,—a loose surface, freedom from weeds, and sufficient plant food, with moisture enough to make it available. Bulbs thus produced will be of the most desirable shape, round or conical. If, however, any considerable number come into bloom, the spikes should be cut off as soon as they get above the foliage. This prevents the plants from exhausting themselves by producing flowers and seed. Other things being equal, bulbs from which the spikes are removed as early as possible will be about twice as heavy as those that produce seed unchecked.

The planting and management of bulblets will be considered in another chapter.

CHAPTER V.

Cultivation.

The gladiolus needs the same stirring of the soil that is given to other crops. The reason why the soil must be stirred is a question upon which there are various opinions. Some hold that it is to kill the weeds; some to conserve moisture; others, to let the air to the roots; and, still others, to render the plant food in the ground available. Probably all are right, and the summing up seems to be, "to make the crop grow," so the safe way is to stir often. This cannot be overdone. A crop may be cultivated every day if desired, provided that good judgment is exercised as to the condition of the soil. It should not be stirred when too wet. The gladiolus has not a very long season for growth, and if best results are to be obtained it must be kept growing continuously. The next best thing to frequent stirring of the surface is a mulch to keep it loose and moist, but this is not as good.

Support.

The critical period in the life of the gladiolus is the blooming season, and some support at that time is almost indispensable. It grows so tall and offers so much resistance to the wind that the stalk is liable to be strained or broken, to the detriment of the bulb, and every effort should be made to keep

it upright and prevent its being injured, even a little. When we consider that each leaf is connected with the bulb, and is doing its part towards bringing it to maturity, we readily perceive that whatever hurts the foliage also hurts the bulb, and realize the importance of preventing, as far as possible, any weakening of the connection between the two.

Deep planting is the first safeguard, and this is rendered still more effectual by ridging up the rows. Cutting the spikes as soon as the first flowers open is a great advantage, lessening the weight of the tops and diminishing its resistance to the wind, besides relieving the plant of the burden of nourishing the blooms. If the flowers are not wanted, the spikes can be cut as soon as they are high enough to escape the foliage, and this is still better. When the gladiolus is grown as a field crop, there are so many tops together that they support each other to some extent. When grown in small areas, it is a good plan to stretch wires along the rows about a foot from the ground, and tie the stalks to them. When the plants are scattered irregularly over the bed, they may be supported by tying each one to a short, inconspicuous stake sharpened and driven into the ground so that the top is fifteen to eighteen inches high. The same stakes may be used year after year, and it improves the appearance of the bed to have them painted green.



MARGARET



RUFFLED TYPE GLORY



CHAPTER VI.

Digging and Curing.

When one has many bulbs to take up it is best to commence early, about the last of August or the first of September. This gives a long season for drying, which is quite necessary, as it is difficult to cure a great many in a short time, especially in unfavorable weather.

The smallest stock should be taken up first, for several reasons: First, the small bulbs grown from seed or from bulblets do not all ripen at the same time, and if digging is deferred until after some of them have matured, these drop from their stems in handling, and keep one picking them up, which is a great hindrance. If taken up in time, they can be pulled off from the green stalks in handfuls. Second, when the little bulbs mature they change color from white to brown, and if any drop it is not so easy to find them in the brown soil. They may be taken up when no larger than apple seeds, cured, and kept till spring with perfect success. Third, the small bulbs are easily dried and, if taken up early, they may be cured and packed away for the winter, entirely out of the way of the larger stock. It is quite an advantage to have part of the stock dis-

posed of early. Fourth, it is slow, puttering work to take up small bulbs running from one hundred to three hundred to the foot of row, and it should be done before cold weather. My rule is to take up seedlings first, then the stock grown from the bulblets, then the next size larger, and so on, leaving the largest to the last. This stock is heavy, and men can keep warm handling it, even in quite cool weather, such as we are likely to have late in the season.

For convenience in taking up small stock, we use a low seat made like a small sled with wide runners which do not sink into the ground. A burlap sack is folded several thicknesses and tacked on the top for a cushion. This seat, a spading fork, a garden trowel, and a half-bushel basket lined with cloth to keep the bulblets from passing through, are the appliances needed for the work. The row is first loosened, or slightly pried up with the fork. Then the man occupying the seat, with the row in front of him, thrusts his trowel under a few inches of it, and with the other hand grasps the tops and lifts the bunch up, giving it a slight shake. He then holds it over the basket, and pulls the bulbs off from the tops, dropping them into the basket. When it is nearly filled, the contents are sifted through a number five sieve (five meshes to the inch) which allows the earth to pass out. A second sifting through a number three sieve separates the bulblets from the bulbs. The latter are then spread out

an inch or two deep in crates, and dried in the shade, after which the depth may be doubled for storage until cleaning time. The bulblets are poured into a box or barrel.

In digging larger bulbs, they are simply loosened up with the fork, lifted out by the tops, which are clipped off close to the bulbs, and are dropped into a coarse sieve, number two, placed over a bushel basket. Through this the earth and most of the bulblets are sifted into the basket. The bulbs are then spread in shallow crates to dry. The crates should be placed where the ventilation is good, and no rain can reach them. The bulblets are separated from the earth with a fine sieve, and put into a box or barrel.

By way of explanation I will say just here that the bulblets grown on small stock are easily separated from the bulbs, as the original bulbs were small when planted and shrink away to almost nothing, thus leaving the bulblets free to fall. With large stock the case is different. The original bulbs were large when planted, and although they wither and die as the new bulbs grow and mature, they still retain a considerable portion of their size. The new bulbs are formed close above the old ones, and the bulblets appear around the line of contact, sometimes between the two, so that they do not all become detached at the time of digging. Those that still adhere are removed in the process of cleaning.

It is advisable to dry bulbs of all sizes as soon as practicable after digging. They look much brighter and more attractive when thus treated than when left lying in contact with the damp soil, for a considerable time, as this gives them a dull, discolored appearance. If grown for market, those that shine like satin are much more salable, and even for planting it is much more pleasing to have them bright than tarnished. Sometimes, when short of crates, or in a great hurry, we have piled up small bulbs with their accompanying soil in the field and left them to be cared for at a more convenient time. They kept all right and could have been kept until spring with sufficient covering, but they lost their luster and became dingy and unattractive.

Bulblets should not be dried. The reason for this will be given elsewhere.

CHAPTER VII.

Cleaning and Grading.

When bulbs are taken up, it is necessary that they should be dried to some extent before the work of cleaning begins,—the large ones partially at least, and the small ones wholly, for reasons which will be explained hereafter.

When large bulbs are dug, the old ones that were planted adhere so firmly that a good deal of force is required to separate them. For this reason it is not economy to clean them at once, so we store them in shallow crates, to the depth of two or three inches, and let them dry. They can then be filled in to the tops of the crates, which are four inches deep, and left until a convenient time for cleaning.

In two weeks after they are taken up, the older bulbs can be removed with a slight effort, but we reserve this work for stormy days. This is the way it is done: A number two sieve is placed upon a tight bushel basket, and filled with the bulbs to be cleaned. The old bulbs are taken off by hand and cast aside, carrying the roots with them, and the bulblets that still remain fall through the sieve into the basket below. The cleaned bulbs are dropped into another basket and then stored in crates to

await the time for grading. The bulblets are put away in a cool damp place. Bulbs three-fourths of an inch or more in diameter are cleaned one at a time, as described, but smaller ones are treated differently. There is much waste matter connected with them, roots, bits of tops, and soil, and the work of cleaning them is done out of doors on windy days in order that the trash and dust may be blown away. This explains why small stock should be thoroughly dried before it is cleaned. The bulbs are placed on a table or platform where the wind can have free play, and pulled and twisted by hand-fuls, until the most of them are separated from the rubbish. Those that still remain are picked out, and the trash is pushed off from the table. The bulbs are then put into a fine sieve and the remaining dust is sifted out. This process usually brings to light the last remnants of dry roots, leaves, and husks, and these are disposed of by pouring the bulbs from one bushel basket to another in the wind. At one time I had this finishing work done on more than half a million small bulbs with an old-fashioned fanning mill, and it was done to perfection.

Grading.

After the bulbs are cured and cleaned, the next step is grading, or separating them into classes according to size. This is absolutely necessary if the bulbs are to be sold, and almost as much so if they are to be planted. As to the sizes of the different grades, every grower seems to be a law unto him-

self. An effort has been made by the Society of American Florists to establish a uniform standard of division, and this will doubtless be accomplished in time. At present the most common arrangement of numbers and sizes, seems to be about as follows:

First size (No. 1) $1\frac{1}{2}$ inches in diameter and up.

Second size (No. 2) $1-1\frac{1}{2}$ inches in diameter.

Third size (No. 3) $\frac{3}{4}$ -1 inch in diameter.

Fourth size (No. 4) $\frac{1}{2}$ - $\frac{3}{4}$ inch in diameter.

Fifth size (No. 5) all below one-half inch.

Numbers one, two, and three, are considered regular blooming sizes, and are bought and sold by seedsmen. Number four bulbs will nearly all bloom, but they are seldom offered for sale, except to the trade. Number five are not supposed to bloom at all, but a few of them will do so. There is a great difference in varieties in this respect, some blooming much smaller than others.

Bulbs may be approximately graded by screening them through sieves with meshes of proper sizes, from an inch and a half down to half an inch, and this is the most speedy way of doing the work. The necessary correcting can be done by hand when counting them out for sale or preparing them for planting.

Crates.

Some allusions to these have been made in the foregoing pages, and it may be well to preface the subject of keeping the bulbs over winter by describing the receptacles in which they are stored.

I have used crates of two sizes. The larger ones

are three feet by four, and four inches deep, with bottoms of lath running lengthwise and placed a quarter of an inch apart. Strips of 1x2-inch stuff are nailed across the corners, on both top and bottom, exactly opposite each other, so that they will come together and keep the crates apart for ventilation when piled one above another. The upper strips also serve as handles by which to lift the crates. They should be far enough from the corners so that bulbs can run out between when emptying the crates, and yet not so far as to make it difficult to take bulbs out from under them with a shovel. The ends of these corner pieces should be sawed beveling, so as not to project and be in the way. There is also a 2x2-inch strip nailed across the middle of the crate on the under side, to support the lath.

The smaller crates are half the size of the others, two feet by three, and four inches deep. The bottoms are tight, and three-eighths of an inch thick. The corner pieces are two inches wide and one inch thick. No strips are needed across the middle underneath.

The smaller crates are preferable for several reasons. First, they can be handled by one man while the larger ones, when filled, require two. Second, the tight bottoms prevent any mixing of varieties, which may happen in using the larger crates by the bulblets dropping through from one to another. Third, the small crates can be easily and entirely

emptied, while the large ones retain bulblets or very small bulbs in the spaces between the lath, and when varieties are to be kept separate these must be carefully picked out. In storing mixed bulbs, or a large quantity of one variety, the last two objections do not hold, but crates containing kinds that should be kept pure cannot safely be placed one above another when the bottoms are slatted. It may be asked why the large crates are not made with tight bottoms. They have a capacity of two bushels each, or more, and when filled with damp bulbs fresh from the ground, they must have bottom ventilation in order to dry their contents. The small ones, holding only half as much, do not need the draft from below.

CHAPTER VIII.

Winter Storage.

An excellent way to keep blooming bulbs through the winter is to pack them in crates, and pile these in a cellar without artificial heat, where the mercury ranges from thirty-five to forty degrees in cold weather.

Small bulbs may be kept in the same way, but they should not be more than two or three inches deep in the crates. They settle into a more solid mass than large bulbs, and if too deep they are liable to start into growth. This should be carefully guarded against.

Small quantities of bulbs may be stored in half-bushel baskets, from two to four inches deep, according to size, and hung up in the cellar.

Bulblets may be packed in boxes or barrels without regard to depth. They do not need to be cured in the fall, like bulbs, as a little drying hardens the shells in which they are enclosed to such an extent that many of the tiny shoots are unable to break through when the growing season comes. They should be packed away when taken off from the bulbs at digging or cleaning time, and a cool, damp place for keeping them is best. Some of them will

sprout in storage, which, of course, is not to be desired, but it is better to lose the few that will grow too soon by dampness than the many that will be kept from growing at all by drying. The ideal place for storing bulblets is a root cellar, or underground room not connected with any building, which is securely closed after the stock is put in, and not opened till spring. Here it is kept fresh and moist and perfectly safe from fire and frost. Another excellent way to preserve bulblets is to pack them in boxes and bury them in the ground, as our forefathers did potatoes and apples. They must be covered sufficiently to guard against any possible danger from freezing and with this precaution they come out in fine condition at planting time.

When a few bulblets of some choice variety are to be kept by themselves, it is a good plan to wrap them in paraffin paper, and enclose them in a paper bag, which may be marked to show its contents.

Packing Bulbs for Shipment.

When bulbs are well cured, the chief danger in shipping is from frost, and this is much greater in transportation by freight than by express. They are longer on the way, and more exposed to cold. However and whenever shipment is made, and whatever packages are used, whether boxes, barrels or baskets, they should be thoroughly lined with many thicknesses of paper to guard against possible harm. Paper is an excellent non-conductor of heat and cold, and packages well protected with it may be considered secure for fall or spring shipments, when a

few degrees of frost are to be guarded against, but not extreme cold. When bulbs are to go by freight in winter, every precaution should be taken to make them absolutely safe. The paper linings of the packages should be increased in thickness, and in addition to this some good packing material, as sawdust thoroughly dried, planer shavings, buckwheat chaff, or ground cork, should be mixed all through among the bulbs. This prevents the frost from entering. As an additional safeguard, the bulbs may be put into strong sacks, with some one of the materials before mentioned among them, the sacks packed into the box or barrel, and all the crevices among them filled with straw, excelsior or paper. This mode of packing is especially suitable when several varieties are comprised in one order.

In shipping high-priced bulbs, it is sometimes advisable to pack them carefully in a box, and enclose this box in another a few inches larger every way, filling the space between on all sides with dry sawdust. It is much the better way to make costly shipments in mild weather, if possible.

It seems hardly necessary to speak of sending bulbs by mail, but a few words may not be amiss. Almost the only danger in such cases is that of freezing on the ride with the rural carrier, and this can be guarded against in a great measure by using plenty of paper in wrapping, and buckwheat hulls for filling. It is better to pay postage on a little extra weight than to risk injury to the valuable goods enclosed.



MASTODON
Less than half natural size
(A poor illustration.)

CHAPTER IX.

Growing from Seed.

There is great satisfaction in growing the finest gladioli that have ever been produced in all the world. The consciousness that one has the best obtainable gives pleasure, but raising seedlings of one's own, knowing that they are different from any others, that no two are exactly alike, and that among them may be one or more of the very finest, and ultimately finding this possibility realized, is one of the greatest delights in horticulture. One ounce of good seed will produce about three thousand bulbs, and among them will be found a large number of fine varieties. If the seed is from choice stock, with no common varieties near, most of the seedlings will be worth saving. So I advise every grower to raise seedlings. They will yield both pleasure and profit. Some years ago I bought all the seed that was offered by the pound in America and Europe, about thirty pounds, and no one but myself ever knew the satisfaction that came from that investment. At another time I was growing a bed of seedlings and the grasshoppers cut them off at the ground early in the summer. I supposed that they were ruined and went to plant something else

on the bed a week or two later, when, to my surprise, I found small bulbs, about the size of apple seeds. I saved them with great care, sixteen thousand in number, and planted them the next spring. They made a fine growth and nearly all bloomed the year following. The pleasure they gave, not only to myself, but to my friends, paid many fold for the time spent on them, and more than made up for the disappointment I had felt when I thought the grasshoppers had destroyed them.

The gladiolus opens its first flower in the morning, and the work of going over a bed containing hundreds that have just bloomed for the first time, and marking the finest with tags upon which are inscribed a few characters that mean much to the owner, and almost nothing to anyone else, will give one an undercurrent of joy for the rest of the day. Another special pleasure that comes to the grower of choice seedlings is that of naming one for a friend, and this pleasure has been mine a number of times. The most notable example of this is the May, and I fully expect that some of those which have scarcely been heard of as yet will become equally as popular as that well-known variety.

In growing seedlings, it is best to use land that is nearly or quite level, so that it cannot wash. The soil should be thoroughly pulverized, and enriched by the use of some complete commercial fertilizer scattered over the surface at the rate of six or seven pounds to the square rod, and well stirred in. Then

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make drills twelve inches apart, from one to two inches wide, and half an inch deep. These drills should be laid out cross-wise of the bed, and may be made by gently pressing a narrow strip of board into the mellow earth. Sow the seed thick enough to cover the bottom of the drill, and sprinkle over it fine earth to the depth of three-fourths of an inch. This should be pressed down with the foot or a roller, so that it will be only half an inch thick over the seeds.

Some provision must now be made for keeping the surface of the bed moist until the seed comes up, which requires two or three weeks under favorable conditions, and may take much longer. If the surface dries after the seeds sprout, they are likely to perish. The best way to prevent this is to furnish shade. For a small bed, a piece of burlap spread over it, and kept in position by a stone at each corner, is excellent. I have generally used a light covering of straw, held in place with strips from the planing mill. Another method of keeping the straw in place is by stretching binder twine directly over the row. When the young plants appear, a straight edge is placed just outside of the row, and the straw is cut through with a sharp knife, first on one side and then on the other. The part over the row is then removed, and the rest left for a mulch. There are, however, two objections to the use of straw as a covering: moles sometimes work under it, heaving up the ground

to the detriment of the crop, and it nearly always contains objectionable seeds. One of the most extensive growers in my acquaintance shades his seed beds with the shallow crates in which he stores bulbs through the winter.

After the seedlings come up they should be kept perfectly free from weeds, and the surface should be stirred frequently. In an ordinary season the bulbs will run from one-fourth to one-half inch in diameter, and with the best possible opportunity they will grow somewhat larger.

Seedlings should be taken up as soon as they show the first sign of ripening, i. e., when their tops begin to turn yellow. The reasons why this work should be done early are given under the head of "Digging and Curing," which also describes in detail the mode of doing it. Most of the earth falls off in the process of taking up the bulbs and pulling them from the stems, and the rest is sifted out. The bulbs are then put into flats, an inch or two deep, and allowed to dry. Sometimes they are dried with the tops on, and kept in that condition till planting time, but most growers prefer to take them off when green.

CHAPTER X.

Growing from Bulblets.

Success with the *gladiolus* depends more upon the use and management of bulblets than upon any other one thing. Let us suppose the case of a person who grows bulbs in his garden for flowers, and saves only the bulbs, allowing the bulblets to go to waste as of no value,—and this is exactly what many people do. What is the result? The bulbs that are saved have bloomed, nearly all of them at least, and consequently they are somewhat flattened in vertical diameter, which is more or less of a falling off from the ideal round or conical shape. These are planted and bloomed the next season, and only the bulbs are saved, as before. This process is repeated year after year, the bulbs becoming gradually thinner and less vigorous, the spikes diminishing in height and the flowers in size, until, by and by, the grower comes to the conclusion that his bulbs have “run out.”

Now follows the experience of one who saves the bulblets, or a portion of them. He plants them, and they make bulbs, mostly too small to bloom. The next year these are planted, and in turn make larger bulbs, of blooming size, perfect in form,

and capable of yielding spikes of flowers that will be an honor to the varieties from which they were grown.

The first example shows why bulbs deteriorate when only bulbs are saved, and the second, how to keep them up to a high standard of vigor by renewing them from time to time with bulblets.

As success with bulbs depends largely upon the use and management of bulblets, so success with bulblets depends, to a great extent, upon the care given them while out of the ground. This has been dwelt upon in a former chapter, and may be still further emphasized to good advantage. Bulblets may easily be kept too dry, and herein lies the principal danger. They should not be stored where artificial heat can reach them nor where they are exposed to drafts of air. The effect of drying, as previously explained, is to harden the coverings, and render it difficult for the sprouts to make their way out. It is best never to let them get dry from the time they are taken up till they are planted. There is but little risk of keeping them too damp, and yet this is possible, as, for instance, when the receptacles in which they are stored are allowed to stand on a wet cellar bottom. In such a case a large part of them will grow before they can be planted, and so be lost. On account of the necessary dampness to which they are exposed through the winter, they should be planted early, four or five weeks before corn planting time, if

weather and condition of soil permit. The bulblets of some varieties sprout early and at a low temperature and an active effort should be made to get them into the ground before this comes to pass. The soil may be too cold to start the majority into growth, but the shells will still be softening and getting ready to grow as soon as there is sufficient warmth.

The growing of bulbs from bulblets is such an important part of the business that it seems best to describe the process in detail, even at the risk of some repetition. The ground used for this purpose should be level, or as nearly so as possible, to guard against washing, and the soil should be made very fine. The rows should be made straight, of uniform depth, about two inches, and rather broad, so as to give a good width of bottom surface. If horse labor is to be employed in the cultivating, the rows will need to be from thirty to thirty-six inches apart; if a wheel hoe is to be used, eighteen inches will be ample, and when land is precious the space may be diminished to fifteen inches, or even twelve, though the latter is too narrow for convenience. The bulblets should be screened through sieves of different meshes, so as to have each size by itself, in order that the growth may be uniform.

Sow them very thick in the row, from one hundred to three hundred to the foot, and have

the bulbs average half an inch in diameter. They seem to do best when very thick in the row, perhaps because there is such a mass of stem that they can lift up the covering of earth and come through with ease. Whenever I have sown them thin, with a view to obtaining larger bulbs, I have been disappointed. They seem to exhaust their energy in pushing their way out of the shells and up through the soil, and their subsequent growth is not strong enough to be satisfactory. As a rule, it is the object of the grower simply to change the bulblets into bulbs, without special regard to size, but even if the latter were the chief consideration, the end would probably be better attained by close sowing. What they lose by crowding each other seems to be more than made up by their mutual help in overcoming the obstacles which they encounter in starting.

After the bulblets are sown, cover them slightly with the foot, treading the earth directly over the rows. Next, sow a complete fertilizer, at the rate of a thousand pounds to the acre, along the rows in the tracks made by the foot and then draw the soil from both sides over the fertilizer, making quite a ridge above each row. In small areas this work may be done with the hoe, but in large ones it is better to use the cultivator with the wings attached, as in covering bulbs. As soon as the weeds start on the ridges, they should be lightly stirred with a steel rake. A fine harrow or weeder

may be used on large plantations, if preferred. This stirring destroys the weeds over the rows before the bulblets are fairly sprouted. A little later, when the shoots are nearly ready to come through the ground, go over the rows again with the steel rake, and level them down. This kills the second growth of weeds, makes the surface clean for the young plants, and does away with the first weeding, which is a costly item. It is important that this second stirring be done at the right time. If too early, weeds will come up in the rows with the bulblets; if too late, some of the young, tender shoots may be injured.

If there is reason to think the bulblets too dry at planting time, they may be put into sacks and soaked in water a day or two. In fact, however well they may have been kept through the winter, it is not a bad plan to soak them before planting. This gives the shells a more thorough moistening than they could get in storage or in the ground, and this cuts short the time required to soften them, and accelerates the coming up by just so much. Some growers spread them on the cellar floor, wet them, and cover with burlap. They are stirred every day, and kept moist until they begin to sprout, when they are planted.

A bed of bulblets should receive the most thorough and careful cultivation from the time the little shoots appear until the crop is ready to be harvested. The surface should be stirred often to

keep down the weeds and encourage a steady and vigorous growth. Inasmuch as the product is a valuable one, it pays to give it every advantage. The work of harvesting is described at length under the head of "Digging and Curing."

There is one curious fact connected with bulblets, which is worth mentioning. Although they need the most judicious care when out of the ground, if best results are to be attained, their vitality and tenacity of life are such that they may be left around, exposed to all kinds of weather, and treated with perfect neglect, and yet, when they come in contact with the earth some of them will grow. I recall an instance of a barrel of bulblets that stood in a shed through two winters and one summer, and when the second spring came they were poured out on the ground, and probably twenty per cent of them sprouted.

CHAPTER XI.

Peeling Bulblets.

It is sometimes desirable to increase a stock of bulbs faster than it can be done in the ordinary course of nature, even with the best of care and skill in growing. This is often the case with new, high-priced varieties, and occasionally with an old and popular one that naturally increases very slowly, as the Shakespeare. It has been discovered that this end can be achieved by peeling the bulblets before planting. Even if the bulblets have been kept in perfect condition, the shells are somewhat of an obstruction to their growth, and it is easy to see that the removal of these would be a great advantage by giving the kernels freedom to start and flourish unhindered. The hard covering is nature's safe protection for the beautiful little bulblet within, and it comes so near to being waterproof and air-tight that the tiny sprout is slow in making its way out. Many of them remain shut in, and so are lost to the grower. Careful peeling overcomes this difficulty, and they all grow, like bulbs. Not only this, but they grow much larger for the peeling, and also yield a fair product of bulblets, thus increasing their rate of multiplication in various ways.

When I first heard of the advantages of peeling bulblets I decided to try it, and engaged a number of girls to do the work at their homes in the winter, paying ten cents an hour. I had a choice lot and the work amounted to over thirty dollars. I found that there was a difference in girls. Some did the work carefully and others bruised or wounded the tender kernels. The bulblets were put away in the cellar, and in a short time they became a moldy mass. They were a complete loss, for not one of them was planted, and the ruin of my choice bulblets hurt more than the waste of the money. After that I had very little confidence in peeling bulblets, until Mr. E. V. Hallock of Long Island, New York, one of the most experienced and skillful growers in the country, gave me an important item of information, which explained my failure and revived my interest in the subject. This was the secret: "The bulblets should be peeled the same day they are planted." Mr. Hallock also gave me some valuable hints on cultivation.

By experimenting on the work of peeling, I have found what seems to be a good way of doing it. Hold the bulblet firmly between the thumb and fingers of the left hand,—unless you are left-handed,—with the top upward. Then with the thumb nail and first finger of the right hand take tight hold of the point of the shell, and pull to the right, as if husking an ear of corn. This will usually strip off a piece of the covering, leaving a

part of the kernel bare. Now take a sharp-pointed, thin-bladed knife, and insert the point under the edge of the broken shell, being very careful not to cut or bruise the kernel, and lift up the husk in pieces, until it is all removed.

For planting, make the soil rich and fine, as much like potting soil as possible, and have the ground ready when it is time to plant corn. Lay out a bed four feet wide, and rake it smooth. Make drills across it about an inch deep, more rather than less, and far enough apart to permit working between with a narrow hoe, say six inches. Place the newly peeled bulblets in the drills, about an inch apart, and cover at once with sifted sand, about two inches deep, and then press it down level with the surface. Sand is preferable to most kinds of soil, because it never bakes, and not only this, but it shows where the rows are, so that if it becomes necessary to hoe the surface before the young plants appear it can be done without danger of injury to the bulblets. The bed should have frequent stirring and perfectly clean culture.

Bulblets thus treated will produce bulbs from three-fourths of an inch to an inch or more in diameter. They will also yield a goodly number of bulblets the first year, and the second year the increase will be still greater.

Soaking the bulblets, as mentioned elsewhere, is next best to peeling, and is available for large

quantities, while the latter is profitable only in special cases.

I will add, by way of suggestion, that I have lately tried peeling bulblets in advance of planting, and mixing them with potting soil to keep. My work along this line has not been extensive enough to warrant pronouncing it a success, but the few bulblets that I have experimented with have kept perfectly.



Black Bulblets
(Hard Shell)



TYPES OF "SCRIBE,"
(Not Eugene Scribe)
A fine example of the Childsli Class.



CHAPTER XII.

Growing for Specific Purposes.

Gladiolus growers have different objects in view in carrying on their work, and it is managed according to the results desired. He who raises bulbs for sale uses every effort to increase his stock and to cause the bulbs to make the greatest possible growth during the season. He prepares the ground thoroughly, plants deep to support the tops, gives plenty of nourishment and the best of culture, cuts the spikes as soon as they are high enough, and as a result he harvests a crop of large, well formed bulbs that are pleasing to buyers and satisfactory in every way.

He who grows for flowers, takes the same pains in preparing, enriching, and tilling the soil, and supporting the tops, but when the spikes appear, instead of cutting them at once, he allows them to go on growing until the flowers begin to open. Then he cuts them judiciously; if for sale, with long stems and plenty of foliage; if for home use, with less of both. This is his harvest, and the bulbs, which are taken up later, may be considered a by-product. When the flowers are cut with much foliage the bulbs are dwarfed, but this does not

matter when the flower market pays more for the spikes than the bulbs would bring if grown to perfection. The object in growing is naturally decided by the prospective gains. If a crop of bulbs will yield greater profit than a crop of flowers, the flowers are sacrificed and the bulbs are given every advantage; if the flowers will bring better returns, the bulbs take second place, and the attention is centered upon developing the blooms.

He who grows for seed gives the same preparation and care as the others. Then, instead of cutting the spikes at the earliest opportunity, as in growing for bulbs, or when they begin to bloom, as in growing for flowers, they are allowed to come out, display their beauty for awhile and fade. After this the small green pods appear, fill out, and ripen, and then the producer of seed reaps his harvest.

There is much to be said upon the subject of growing and saving seed, and the details of this fascinating work will be considered in other chapters.

Keeping Cut Flowers.

While gladiolus blooms are exceedingly beautiful when fresh and well cared for, they are very unattractive when neglected, and it requires so little attention to keep them at their best that it seems a pity they should ever be allowed to suffer for the want of it. The best time to cut the spikes is when the first flowers unfold. Put the stems into water, and the next day there will be more blossoms open,

and then more, and so on, until sometimes there is a large number out at once. Varieties differ very much in this respect. Some will display six or eight blooms, or even more. The largest number I ever saw on one spike at one time was fourteen, and that was a very rare case. On the other hand, some kinds no sooner open three or four blooms than the lower ones begin to fade. This is equally true whether they bloom on the plants or after they are cut. It seems that some stems are unable to take up moisture enough to supply more than a few flowers at once. Ordinarily, a vase or jardiniere filled with freshly cut spikes will look nice for two or three days. By that time they will have bloomed up far enough so that the first flowers begin to wither. After this, they should receive attention every day. The faded flowers should be taken off, the stems shortened accordingly, and the water changed. With this treatment the bouquet keeps fresh and beautiful until the last bud opens.

It shortens the life of cut flowers of any kind to stand in the sun, or to be exposed to a current of air, and the gladiolus is no exception.

Marketing Flowers.

In cutting gladiolus spikes for shipment it is best to do the work in the morning, as far as possible. In the daytime, especially when the sun shines hot, or the wind blows, or both, the plant gives off moisture rapidly, and flowers cut under such conditions are liable to wilt, unless their stems are placed in

water immediately. During the night, evaporation is diminished or suspended, while the roots continue to take up moisture. The dew also has an effect, and in the morning the plants are full of sap. This is one reason why, it is best to cut the spikes early, and another is that the new blooms expand at that time, and so are perfectly fresh. If one has large quantities to cut, it may be necessary to continue the work all day, or the greater part of it, and in such a case, or, in fact, whenever it is done, it is a good plan to stand the spikes in water for a time, if convenient, and give them an opportunity to fill their stems. Flowers thus refreshed will last longer than those that do not have a chance to drink.

There is a difference in markets as to the length of stems demanded. Some require them to be very long, with much foliage, and in such cases the prices should be high enough to pay for sacrificing the bulbs, which are rendered almost worthless by such cutting. When stems of moderate length are acceptable, it is a good rule to cut down to the third leaf below the spike, taking only the two small ones nearest the flowers. This method gives the bulbs an opportunity to grow large and strong.

For shipment, the spikes are tied in bunches of twenty-six to twenty-eight, so that each bunch will make two liberal dozens. They are then placed in an upright position in a crate, box, or other receptacle. There are various styles of packages, and each shipper chooses to suit himself. One

season I shipped thousands of spikes in tall candy pails, with an inch or two of water in the bottom. They started at night and arrived at their destination in the morning, "as fresh as daisies," the commission man said. If the spikes are slightly wilted in transit it does little harm, as they revive very soon after being placed in water, though it is probable that any wilting shortens their term of service more or less.

Some growers cut the spikes before any flowers open, tie them in small bunches, wrap in paper, and pack in crates, in layers. This method is good for very long distances.

There is one other mode of shipping which I adopt when I wish to send spikes that have several blooms open, without injury to the flowers. I take a half bushel market basket, line it with waxed paper, sprinkle damp moss in the bottom, and then "string" the basket,—that is, sew strong cords across it with a sail needle, three in each end at the top, about three inches apart, and three others below these, an inch or two above the bottom of the basket. The flowers are then put in slantwise, beginning at the ends of the basket, and working towards the middle, until the space is all occupied. The lower cords hold the ends of the stems in place, while the upper ones support the weight of the flowers, and keep them from crushing each other. A basket thus prepared will carry from fifty to one hundred spikes, according to the angle at which they

are placed. The nearer upright their position the more the basket will hold, but an angle of forty-five degrees is as much as they will bear without swinging sideways and becoming disarranged.

It is sometimes desirable to send a spike by mail, and this can be done to perfection by enclosing it in a pasteboard tube, such as publishers use for mailing pictures. It should be drawn into the tube stem first, and out the same way.

Growing and Saving Seed.

One of the most interesting branches of gladiolus culture is the growing of seedlings, and a very important part of this is producing the seed. Of course, seed can be bought, but it is more satisfactory to the grower to raise it himself, as far as practicable, and know what it is, besides eliminating an item of expense. Spherical or conical bulbs are more vigorous, and therefore better for this purpose, than flat ones of the same sort. There is a difference in the productiveness of varieties in regard to seed, as well as bulblets, some yielding little or none, while others bear freely, but in the latter case it is not best to permit the bulbs to ripen the greatest possible amount. When they begin to bloom they should be beheaded, leaving only the lower flowers and buds, say four, or five, or six, and these will develop large, strong pods, filled with seed of the best quality in point of vigor. This method is also advantageous to the bulbs, which, though only a secondary consideration, are not by

any means worthless. For the benefit of both seed and bulbs, the matter of cutting off the buds that are not wanted should be attended to promptly as soon as the first flowers uncloze.

When the seed begins to ripen, it should be watched, and secured at the proper time. At a certain stage the pods burst open, and if left long after this, the seeds, which are very light, are apt to be blown away. The careful grower wishes to save every seed, for he has a feeling that if one is lost, that one may be the choicest of all.

CHAPTER XIII.

Crossing or Hybridizing.

These expressions seem to be popularly used in a rather free way, as applied to the gladiolus, to denote the bringing together of different varieties, for the purpose of obtaining seed, which shall produce new and diverse kinds, combining in some degree the qualities of the parents, and presumably of superior excellence. Accepting the foregoing terms in the sense alluded to, as meaning simply a mixing of stocks, or of varieties, there are two ways of securing the desired results, the natural and the artificial. In the former, insects and the wind do the work; in the latter, it is done by hand. It may be worth while to speak of these methods somewhat in detail, with the prefatory statement that a variety is not supposed to reproduce itself from seed, and as a rule it does not. Although there are instances in which seedlings bear a close resemblance to a parent, or to each other, theoretically no two are alike, and in reality there is a wide range of variation among those grown from the same bulb. In this variation lies the charm of the work and the secret of success.

Suppose the grower wishes to cross two varieties in the natural way. He plants the bulbs near together and apart from others, far enough distant so that their pollen cannot reach the blooms. Between the two there is an interchange, each being fertilized by the other, and the results will comprise as many variations as there are seeds produced. Several kinds may be planted together in the same manner and the consequent combinations will be still more numerous and varied. If the amateur wishes to save seed from his bed of mixed bulbs, he watches the blooms as they come out and cuts and carries away any that are not desirable to propagate from, so that they may not affect the seed of the others. By this method all the seed saved is of a high grade of excellence, and the new developments from it are exceedingly interesting.

When the grower purposes to cross two varieties artificially, he goes about it early in the morning, when the blooms first open. He selects the flower which is to be the mother parent, cuts away the stamens with sharp pointed scissors, and then covers it with cheese capping, to keep out strange pollen. From ten o'clock in the forenoon to about four in the afternoon, the pistil secretes a honey-like liquid, which causes the end or stigma to be moist. It is then said to be receptive, and the grower carries the stamens from the other parent, and gently

touches the stigma with the anthers, causing the pollen to adhere.

Hand-hybridizing can be carried on in a garden, or any small area, while special crossing done in the natural way requires a great deal of room. The artificial method also has the advantage of being perfectly exact, while in the other there is a possibility that pollen carried by bees may be introduced, even at a considerable distance.

Whichever plan is adopted, the work is very fascinating, and if the grower succeeds in attaining the realization of his ideals along the lines he is pursuing, or even a near approach to those ideals, the pleasure he experiences is ample recompense for all his efforts.



CONTRAST
(Childsii)



CHAPTER XIV.

Enemies and Diseases.

The gladiolus has almost no enemies, and the same may be said of diseases. The bulb has a very unpleasant taste, and is somewhat poisonous. It is not eaten by mice or grubs. The black aster beetle is fond of the flowers, and is quite a pest when very abundant. These insects have a preference among colors, and attack the red flowers first, especially a scarlet sort named Bertha. They will single out the spikes of this variety in a field of mixed colors, and devour the very buds as soon as the red comes in sight. They are especially troublesome when the weather is hot and dry, as they can then fly readily. When it is cool and damp, if jarred from the spikes they fall to the ground, and are slow in regaining their places. The grower of flowers, either amateur or commercial, finds in these insects an enemy hard to contend with, but the grower of bulbs pays no attention to them, as they do him no harm.

In regard to diseases, bulbs sometimes become scabby, but this seems rather an accident than a disease. It is apparently due to conditions, and is not perpetuated by heredity. Perfectly sound bulbs

may produce scabby ones, and vice versa. If healthy bulbs are planted in a place that is too wet, or that is subject to frequent overflow, or if they come in contact with barnyard manure in the ground, or if the foliage is seriously injured in the growing season, the product is liable to be scabby. Some years ago I had a field of gladioli, one end of which proved to be a runway for dogs, and the plants that came in their way were broken, or partly broken. As a consequence, many of the bulbs in that part of the field were scabby, but these, planted in a different place, produced smooth ones the next season. If bulbs are taken up and cured immediately after the tops have been injured, by wind or otherwise, they will be sound and in good condition for the next year, even though not half grown; but to be deprived of their foliage, or a large portion of it, while the roots remain undisturbed, appears to destroy the balance, and cause bad results.

In some localities the gladiolus is affected by rust, which turns the tips of the leaves brown in the growing season. If this is a disease, the remedy does not seem to have been discovered, but in numerous instances careful observation will show that it is due to local causes. The foliage is sensitive to atmospheric conditions, and cannot be successfully grown where it is subject to poisonous gases. Smoke from a pottery carried over the bed by prevailing winds is almost sure to be fatal. Salt is thrown into the kilns to glaze the ware, and the

chlorine set free is deadly to many plants. Even smoke from factories is more or less injurious, and many cases of rust can be traced to some such source.

Taken all in all, the gladiolus is one of the most reliable of crops. (See Note.)

Note:—There are three well defined diseases affecting gladiolus bulbs during growth and in storage, soft rot, hard rot, and scab. There is no cure for the two former, but they may be controlled by discarding all affected bulbs and planting in fresh soil free from animal manures. Scab may be greatly reduced by soaking all diseased or suspected bulbs, after removing the outer coatings, for twenty minutes in a solution of bi-chloride of mercury, fifteen grains to each gallon of water, or for same time in solution of formalin, one pint to thirty gallons of water.

CHAPTER XV.

What Constitutes a Good Variety.

The different types of the gladiolus vary so widely that they cannot be measured by one fixed standard, but there are some general requirements of excellence that apply to all. Vigorous healthy growth is indispensable. It is not worth while to cultivate a variety that is constitutionally feeble. Another essential is a fair-sized clean bulb, and it is desirable, though not imperative, that it should produce bulblets freely. The leaves should be green to the tips throughout the season. The spike should be tall and straight, with a good distance between the first flower and the foliage. In some varieties the spike develops so rapidly, and is so tender and succulent, that it is unable to support its own weight. Hence, it makes a crooked stem which is a blemish, however perfect it may be otherwise. Ordinarily, it is better that the spike should not have branches though some of the best kinds do, as May, Augusta, and others. When a variety is used for forcing, and individual flowers are cut, branches are an advantage, as they lengthen the season, but when the whole spike is cut they are useless, and worse, for they exhaust the bulb more or less, and time is

consumed in taking them off. The stem should be able to take up water freely, so that it may open a goodly number of flowers at once. This is a characteristic common to the *Gandavensis* varieties, while the opposite is true of the *Lemoines*. The typical spike should have two rows of flowers facing the same way, and near enough together to conceal the stem, or the most of it, but not so close as to look crowded. The blossom should be finely arched, and open enough to bring out that frank, engaging expression which is peculiar to this flower, and one of its special charms. The petals should be of ample width, to give the bloom a rich generous appearance. Substance in the petals is of very great importance as enabling them to endure exposure. If too thin, they will wilt in a warm or windy day.

There is one more requirement, without which all other perfections go for naught,—fine coloring. It may be light or dark, delicate or rich, solid or a combination of few or many hues, but it must be clear, spirited and attractive, not dull nor muddy, nor faded. The *gladiolus* comprises such a marvelous range of colors, from white up through all the shades of pink, melon, and scarlet, to the richest and most glowing reds; some fine tints of yellow; and innumerable blendings, markings and variegations, that there is no need of accepting or perpetuating an unlovely color or one that requires an apology.

CHAPTER XVI.

How to Obtain a Choice Collection.

There are, as before stated, some qualities which are requisite to a good gladiolus, but this demand does not draw close or inflexible lines. There are hundreds of varieties in existence which possess the necessary traits in a considerable degree, and more are being produced every year by the growing of seedlings. This breadth of variation gives room for the exercise of individual tastes equally as diversified, and it is interesting to observe the differences displayed. One person's ideal may be quite ordinary in the estimation of another. Once, when I exhibited ninety varieties at a fair, I was surprised to see a lady select as her first choice the one which was ninetieth in my opinion.

There are several ways of obtaining a fine collection. If one can afford to gratify his wishes without regard to expense, he can buy named varieties year after year, select those that he most admires, and reject the others. With less outlay he can buy mixed bulbs of a high grade, or unbloomed seedlings, and retain the finest, as before. This is an excellent way, and in no other can a choice collection be obtained for so little money in so short a

time. Another method, which involves still less expense but requires more time, is to grow bulbs from seed, and it is wise to procure the seed from many different sources, in order to attain the most extensive range of colors and characteristics. Seedlings well grown the first year will show a few flowers the second, and the next season all will bloom. The grower can then choose those that please him best, and this work is unspeakably captivating.

CHAPTER XVII.

How to Keep a Collection Vigorous and Well Balanced.

The gladiolus, like other flowering plants, shows the effects of continued neglect or ill usage in diminished vigor and inferior bloom. This is not saying that a variety will "go back" to some ancestral sort, or that it will lose its individuality, but it will become puny and unsatisfactory. This deterioration is principally due to mismanagement, and can be counteracted by a change of methods. Suppose a fine, conical bulb is planted. If it meets with no misfortune it will produce a perfect spike of flowers, and perhaps a dozen or twenty pods of seed. When taken up in the fall, the bulb is almost certain to be small and flat, on account of having exhausted its vitality in blooming and seed-bearing, and if it yields any bulblets they will probably be so diminutive as to be thought not worth saving. No amount of skill could get much out of that bulb the second year.

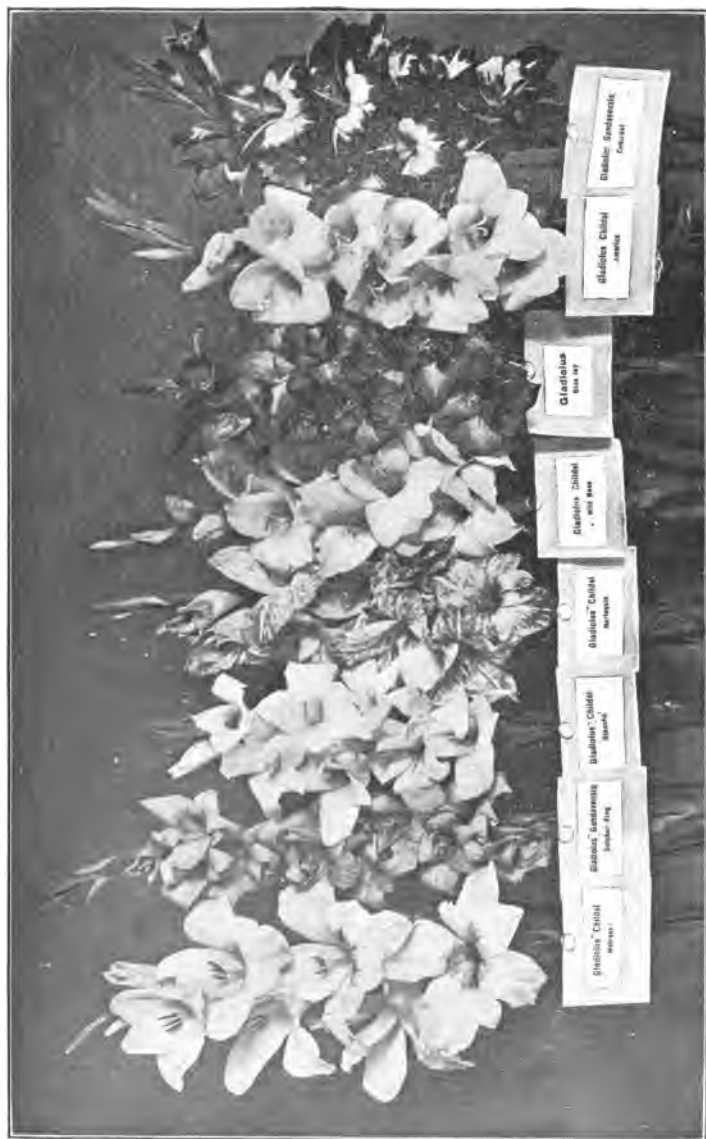
There are two ways to bring it up to its former vigor. First: plant the bulb the next spring under the most favorable circumstances, give it plenty of plant food and the best of care, provide support for the foliage, cut the spike as soon as

possible, and when the bulb is taken up it will be large and solid, and ready to do energetic work the following year. The second, and better way of restoring a variety that has become exhausted, is to save the bulblets, however tiny they may be, pack them in damp sand, and store them in a cool place over winter. In the spring, peel them carefully, and plant according to the directions given in the chapter on "Peeling Bulblets." Give good culture, and the outcome will be a crop of blooming bulbs, and most likely a fair yield of bulblets.

There is another difficulty that besets some lovers of this beautiful flower who take pains to procure fine collections, and give them the best of care, according to their knowledge. In a few years many of their choice varieties seem to have dwindled away to almost nothing, or to have disappeared entirely, while they have a burdensome surplus of some others. They wonder why this is so, and some become convinced that the *gladiolus* will in time revert to some original species. Nearly all such cases may be accounted for by considering that some varieties multiply very much faster than others, both by bulblets and the formation of new bulbs. If one bulb produces a hundred bulblets, another ten, and another one,—or perhaps none,—it is easy to foresee what will happen in a few years.

Another thing to be taken into account is that the grower sometimes divides his treasures with his friends, and in so doing he is liable to give away

the one bulb that does not multiply, thus losing that variety from his stock. He may dispose of a number in this way and, meanwhile, those that increase rapidly are fast taking possession of his collection. There are ways of guarding against this situation. First, when varieties are found to have many bulb-lets, save only enough to keep the stock in balance, and throw away the rest. By being watchful and persevering in this course, much of the difficulty in question can be avoided. Second, if some varieties get the start, and become too numerous, mark them as they come into bloom, with cheap tags, or by some other device, and take them up separately in the fall. Several varieties can be "marked out" at the same time in this way.



Gladiolus 'Sunderland'
Glasgow

Gladiolus 'Candida'
Glasgow

Gladiolus
Glasgow

Gladiolus 'Candida'
Glasgow

Gladiolus 'Candida'
Glasgow

Gladiolus 'Candida'
Glasgow

Gladiolus 'Sunderland'
Glasgow

Gladiolus 'Candida'
Glasgow

CHAPTER XVIII.

Commencing in the Business.

If one desires to grow the gladiolus commercially, there are several ways of making a beginning, and it is well to have a clearly defined plan. The grower can enter upon the work with very little outlay by commencing with seed. Only choice seed should be used. The first year's product will average about the size of peas. With extra pains, many of these could be brought to small blooming size, but it is better to keep them below that limit. The next year they will all grow to first and second sizes and the bulbs will be perfect in form and full of energy. Of these there will be no two alike, and such bulbs are generally in demand. Some will be of superior merit, and many good. Each purchaser will find at least a few that he will prize. By sowing seed every year, the grower will always have fresh stock coming on, and if careful to use only seed of high grade, he will establish a reputation as a producer of fine seedlings. He can, in time, make arrangements for growing seed himself, and thus save the expense of buying, besides enjoying the satisfaction of knowing its excellence.

Another way of starting is by purchasing small stock. This has the advantage of making salable bulbs the first year, also quantities of bulblets, but there is another side to the question, which is less encouraging. If the stock is simply common mixed, which is about the only grade offered for sale, the grower is likely to find that a good part of it is such as he can take no pride in, and he will be under the necessity of beginning soon to weed out the undesirable varieties. The same difficulty will reappear in the crop grown from the bulblets. This method involves more expense than would appear at first thought, and is likely to be rather unsatisfactory as to quality in the end. If small stock of high excellence could be bought, it would be the perfection of a start for a beginner, but it is very seldom obtainable. Every grower knows that bulbs the size of peas are far more prolific of bulblets than those of the same variety two inches in diameter. Accordingly, he sells the large ones, which bring good prices, but make little increase, and retains the small ones, which would yield only trifling returns if sold, but are of great value as multipliers of stock.

Still another and very good way of beginning in the business is to buy blooming bulbs of fine named sorts, cultivate them separately, and sell them by name. He who adopts this plan does not need many varieties. It is better to purchase few, and a larger number of each. If he selects those that are in good demand, he is pretty sure to find ready sale

for all that he can raise. He is not likely to have too many of the May or Augusta, nor of those newer and more expensive favorites, America and Princeps. This last method, and the one first described may be combined to good advantage.

If one wishes to commence growing flowers for market, he may start with seed, provided he can afford the time, or he may buy blooming bulbs, either mixed or named. In the latter case he should look out for a liberal proportion of light colors, as they are usually more salable than darker ones, though of late, good reds are rapidly gaining in popularity. Some growers raise mostly fine white and light varieties, and their flowers are in demand even when the market is full of common stock.

Finally, whatever the grower's objects may be in his work, and whatever methods he may adopt in carrying it on, he will find plenty of room for the exercise of his own judgment and tact, after he has read and pondered all that he can find in print in regard to gladiolus culture.



APPENDIX

By

DR. W. VAN FLEET

APPENDIX

CHAPTER I.

Garden History of the Gladiolus.

The gladiolus is horticulturally the most important member of the Iridacæ or great Iris family and has long been the most popular of all summer-flowering bulbous plants, ranking in general usefulness even such prime favorites as the dahlia, the canna and the lily. Almost one hundred and fifty species have been from time to time described by botanists, but only a fraction of the number has thus far proved of value in breeding and development work. Fourteen or more species are natives of Southern Europe and Western Asia, but these have always been of minor importance as garden plants.

The headquarters of the genus is South Africa, centering in Cape Colony and Natal, though there have been recent finds of value on the mountains of tropical Africa and in Madagascar. The European and Asiatic species run to purple and lilac in coloring, though white varieties occur in

cultivation. Flowers and plants are rather small, rendering them most useful for pot or frame culture and for naturalizing in protected borders where the deeply planted corms can be kept from the effects of frost. The most attractive of these northern kinds are *G. crispiflorus*, *G. atroviolaceus*, *G. Byzantinus* and *G. communis*. The latter has been offered in this country as the "hardy" gladiolus, but it will not endure severe freezing. These species hybridize together when opportunity presents, but do not readily interbreed with the African kinds and have rarely developed garden forms superior to the respective wild types. The blooming time is early spring.

Another series of early-blooming, small-flowered species is represented by *G. blandus*, flesh colored, *G. Watsonius*, scarlet, *G. alatus*, yellow and red, and *G. tristis*, pale yellow, sweet scented. All are native to the Cape of Good Hope and can endure little cold. They are admirably suited for window and greenhouse culture and are interesting subjects for interbreeding, though no startling results should be expected. The winter-blooming varieties grown by florists, such as the *Bride*, *Delicatissima*, and *Peach Blossom*, belong to the hybrid section known as *Gladiolus Colvillii*, which is, without doubt, a hybrid between *G. cardinalis* and *G. tristis*. The corms of these early-blooming species are less resistant than those of the summer-blooming kinds and can rarely be kept over winter in good condition. The species

in this class are many, several are fragrant, and all are worth growing by the specialist for their individual charm, but few are likely to attain commercial importance in this country for a considerable time.

Summer Blooming Species.

Our popular garden and commercial varieties are, with scarcely an exception, developments of strong-growing and relatively late-blooming species found wild in South Africa. The chief of these is *G. psittacinus*, native of Natal, but cultivated in Europe since 1830. It is a striking and robust species with hooded, narrow, red-and-yellow flowers, borne in a scattering manner on a tall fleshy scape or spike. Eleven years later a seedling appeared in the famous Van Houtte Nurseries, Ghent, Belgium, thought to be a hybrid between *psittacinus* and *G. cardinalis*, the latter a tall scarlet flowered species or variety of uncertain origin, known to have been cultivated as early as 1785. The Van Houtte seedling, named *Gandavensis* in honor of the city of its origin, was so superior to *psittacinus* as to cause the latter to at once go out of cultivation.

Gandavensis made a great sensation in its time and is still the best representative of the old-time gaudy red-and-yellow garden gladiolus, or corn flag. It was eagerly welcomed by breeders of the day, among others the accomplished French hybridizer, Mons. Souchet, of Fontainebleu, who really laid the foundation of the modern *Gandavensis* strain, the basis

of all that is best in the summer-blooming section. The predominating types of the finest *Gandavensis* varieties, however, retain few of the characteristics of *psittacinus*. The erect, fleshy stem, capable of absorbing sufficient water, when the spike is cut, to develop all blooms, and the strong upright growth have been preserved as indispensable features, but the flowers have been marvelously improved in respect to form, color, size, arrangement and finish, as the result of interbreeding with every procurable species or variety of sufficiently distinct character, and constant seeding selection. The most popular varieties of the day, such as May, Augusta, and Shakespeare, have little resemblance to *psittacinus* and practically none to *cardinalis*, but exhibit strongly the main characteristics of *G. oppositiflorus*, an old white-and-rose, many-flowered species, often thought to have been the real parent of *Gandavensis*, instead of *cardinalis*. The writer's experience is that present-day authentic hybrids of *psittacinus* and *cardinalis* do not resemble *Gandavensis*, while the issue of *psittacinus* x *oppositiflorus* closely reproduces *Gandavensis* as it is found in old gardens. Varied and beautiful as the *Gandavensis* hybrids or "French seedlings" of the last generation were,—and some have never been excelled,—intense and pleasing shades of red were strangely lacking, when the predominance of *psittacinus* blood in the strain is considered.

It was not until 1878 that Victor Lemoine, Nancy, France, produced, by crossing the finest *Gandavensis* varieties with *G. purpureo-auratus*, an important race now widely known as *Lemoinei*, that possessed the rich and intense shades of red, purple, and yellow so ardently desired by fanciers. Some of the richest coloring in the floral kingdom is found among the *Lemoinei* varieties, now wonderfully developed by consistent breeding. The hooded form of *purpureo-auratus* blooms, however, is often retained, and the stems usually have the wiry texture of the species rendering the development of the flowers, after cutting, less perfect than the *Gandavensis*.

The next great improvement in garden gladioli was brought about by Max Leichtlin, Baden Baden, Germany, who extensively hybridized the best *Gandavensis* varieties with *G. Saundersii*, then a newly introduced species characterized by large widely opened scarlet flowers speckled with white on the lower divisions. The resulting seedlings, without doubt the finest strain of modern times, were bought by V. H. Hallock and Son, Queens, N. Y., then the most extensive American bulb growers, and for many years the stock was worked up by them in the most painstaking manner. Before dissemination it was sold to J. L. Childs, Floral Park, N. Y., who introduced it to general cultivation under the name of *Childsii*. The true *Leichtlin Saundersii* hybrids are characterized by gigantic growth and very large richly colored well-opened blooms with beautifully

spotted and variegated throats. Shades of red predominated at first, but light colors have since been developed in a very satisfactory manner. The only just criticism of this strain is that some kinds lack substance of petal and are not as lasting as *Gandavensis* varieties under similar trying conditions.

Lemoine soon afterwards produced a fine large flowered and brilliantly colored race by crossing *Lemoinei* hybrids with *Saundersii*. This race was named *Nanceianus* and comprises many truly beautiful varieties, few however possessing the vigor of the *Leichtlin* hybrids.

The next break of importance, also the work of Lemoine, came with the use of *G. papilio*, pale lilac, blotched and overlaid with dull red. In many of its hybrids the primitive colors have separated, resulting in an attractive series of rich purple and heliotrope blues, quite new to the genus. True bright blues, free from red and purple tones, have not yet been obtained, but the blue kinds—issue of *Papilio* and the *Lemoine* varieties—are unique and desirable acquisitions.

Gladiolus cruentus, blood red and white, pollenized with a selected *Childsii* variety resulted in the magnificent scarlet hybrid *Princeps*, acknowledged the first of its color yet produced. The latest species of importance to be widely used is *G. primulinus*, recently found in the Zambesi Valley, South Africa. It is a vigorous species with narrow blooms, pure bright yellow in color. The hybrids largely partake

of this coloring, and it appears only a matter of time when good self yellow varieties, comparable in size and finish to the best red and pink kinds will be bred.

Minor Species.

A number of hybrids of *G. dracocephalus*, *G. Cooperi* and *G. Quartianus* have been offered of late years. These species are closely allied to *Psittacinus*, but yellow, green and purplish shades, oddly marked and striped, appear in the offspring. Some are curious and attractive, but possess little value from the standpoint of the commercial grower. *G. Quartianus* is a very late bloomer and may produce varieties extremely useful for mild climates where the seasons are sufficiently long to form bulb development. *G. Eckloni* is a rare species with small whitish blooms, minutely dotted with black purple. The hybrids have mostly purple or red ground colors flecked with darker shades. They are exceedingly attractive, but do not increase with sufficient rapidity to possess great value. *G. vitatus*, an early blooming, dwarf species, has yielded some charming porcelain and salmon colored garden varieties, of rather small size, however. *G. Leichtlini*, scarlet and yellow, allied to *Saundersii*, when crossed with *cruentus*, is a striking brilliant crimson hybrid of much vigor, but when blended with other species entirely loses its individuality. The list may be extended, but enough has been said to indicate the great possibilities inherent to the use of wild

species as a means of adding attractive new features to highly developed garden strains.

Summary.

The gladiolus, in its European species at least, has been in garden cultivation for quite 400 years.

The African forms first found their way to Europe about 1745 and new ones have since been constantly added. The genus now numbers almost 150 species.

The first marked improvement, from the garden standpoint, came with the introduction from Holland, about 1785, of *G. cardinalis*, one of the reputed parents of *G. Gandavensis*. The true origin of *Cardinalis* has never been ascertained.

In 1840 *G. Gandavensis* was raised in Belgium from seed of *G. psittacinus*, an African species supposed to be pollinated with *Cardinalis*, but more likely with *G. oppositiflorus*, which the progeny of *Gandavensis* more closely resembles.

From 1845 until 1880 *Gandavensis* seedlings or "French Hybrids" held full sway in gardens. More than 400 varieties have been named, comprising some of the most highly prized of all garden kinds.

Lemoine introduced in 1878 his justly celebrated hybrids between *Gandavensis* and *G. purpureo-auratus*, known as *Lemoinei*.

The *Nanccianus* strain, crosses between *Lemoinei* and *G. Saundersii*, was introduced in 1889.

Childsii, originated by Max Leichtlin, Germany, was first disseminated in 1893. It consists of hy-

brids of *G. Saundersii* pollinated with the finest Gandavensis varieties.

Lemoine's New Blue was first exhibited at the Chicago Exposition 1893 and placed on sale the following year.

Gladiolus Princeps, *Childsii* x *G. cruentus*, the finest scarlet variety ever raised, was introduced in 1903.

Gladiolus primulinus and hybrids were first publicly offered in 1909.



PRINCEPS

CHAPTER II.

Hybridizing Gladiolus.

The gladiolus, owing to the large size of the blooms and its open character, is one of the easiest of plants to pollinate artificially. Healthy vigorous plants should be selected for seed bearers, and the bloom spike supported with a firm stake. The blooms should be visited in early morning as they open, and the anthers removed before they have shed pollen, with the fingers, or better with slender forceps, taking care not to injure the style or the three-parted stigma, which will be ready to receive pollen about midday in bright weather or late in the afternoon, or even next day if cloudy or dull.

The blooms should, immediately after the anthers have been removed, be covered with thin cheese-cloth, or "bobinet," firmly tied or pinned in such a manner as effectually to keep out bees and visiting insects. Ordinary mosquito netting will not serve after it has been wet with dew or rain, as the mesh becomes so loose that energetic little pollen carrying bees force their way through, often entirely spoiling results. The pollen-bearing blooms should be carefully selected to open the same day and should

be as well protected with muslin or fine netting as possible to prevent robbery of pollen.

About noon, when the anthers are covered with dry-dust-like pollen they can be pinched out with forceps and carried to the seed-bearing spikes in a covered dish to protect from wind. The anthers may be taken separately in the fingers, or with forceps, and lightly brushed over the stigmas, which should be erect and open if they have reached the receptive stage. One anther will usually suffice for a seed bloom if pollen is abundant, but in some of the lighter-colored varieties it is scantily produced and several may be needed. Occasionally the anther valves do not open freely enough to permit the escape of pollen, which may then be taken out with a narrow-bladed penknife, or better with a little instrument made of a flattened pin fixed in a wooden handle.

The pollinated blooms should immediately be covered with the netting, which should remain until they fade. If conveniences are at hand the work may be rapidly accomplished—several hundred pollinations being made in a single day by an active worker. Pollen can also be used from cut blooms, the spikes being kept in water in a light room, free from flies or bees, but it gradually loses power when the upper blooms open under such artificial conditions. If the work is carefully done the resulting seeds will produce hybrids or cross-

breeds as the case may be, and it is always possible that the ideal sought for may appear among the number. Pollen may be kept a week or more by drying in the shade and wrapping in paraffin paper, but is far less reliable than if applied fresh from the anthers.

The blooms of large garden varieties are rarely self-pollinated, even if left uncovered, but the chances of fertilization with inferior kinds, generally the most abundant pollen producers, are so great that it is well to protect all seed-bearing blooms from insect interference. If the work is to be done on a large scale sleeves of netting or muslin large enough to enclose the entire spike will be found serviceable. The ends may be drawn together by cords looped through the fabric, effectually barring out the meddling bees. If a greenhouse structure or even a well lighted room is available, the plants may be grown in large boxes or pots and taken inside when blooming. This is especially desirable in the case of rare species and varieties, as there is no interference from stormy weather. Every bloom can be pollinated and practically every grain of pollen utilized under these secure conditions.

CHAPTER III.

Special Care of Seedlings.

Rare or scarce gladiolus seeds, particularly those resulting from difficult crosses, should not be risked under ordinary garden or field conditions of growth. We naturally wish to bring to maturity every possible plant that the ideal we are breeding for may not be lost, if it should by chance be included in the number. If grown in pots or boxes the first season, with due care every good seed is likely to produce a vigorous bulb that may be planted out next year. I have found six-inch standard flower pots, after many trials, to be the most convenient receptacles for small quantities of seeds, though almost equally good results may be had from well drained wooden boxes five inches deep. The boxes may be a foot or more wide and 18 to 20 inches long, and should be new and clean.

On no account grow gladiolus seeds or bulblets successive years in the same pots or boxes without sterilization, lest disease be fostered. Sterilization may be effected in the case of pots, by roasting an hour or more in an oven at a temperature above the boiling point of water, or by well soaking in bichloride of mercury or formaldehyde

solution, described in a preceding chapter.* Boxes may also be roasted in the oven or soaked in sterilizing solutions, but it is best to use new ones if procurable. Boxes should have at least one half-inch drainage hole to each sixteen square inches of bottom surface, as gladiolus seedlings greatly dislike waterlogged soil. An inch of pebbles, broken shells or sterilized potsherds should be placed in bottom and pot or box filled to within one-half inch of top with light compost made of two parts rich loamy soil and one part sand, well mixed together. Some very old fine manure may be used, but it should be confined to the bottom third of the receptacle and not come into contact with the seeds or resulting bulbs. The seeds, previously rubbed free from chaff, should be thickly sown on the surface—one hundred seeds is not too many for a six-inch pot—and covered with one-half inch of clean sand. Water with a gentle spray until entire mass of soil is saturated, cover top with old burlap or bagging and place pots or boxes in a secure place where the temperature will not vary greatly from sixty degrees. But little more water will be needed until the plants begin to come up, which should be in about twenty days. A sunny situation in greenhouse or garden is needed to grow the seedlings to best advantage, but if in the latter, protection should always be given from beating rains as the tiny seed-

*Page 59.

lings are very easily broken down during the early stages of their development. Water should be given with sufficient regularity to keep the soil constantly moist without becoming sodden and all weeds removed as they appear. The bulbs will mature in twelve to fifteen weeks from germination. Water should gradually be lessened as growth ceases and foliage begins to yellow until the soil quite dries out, when it may be passed through a sieve and even the smallest bulblet secured.

The little seedling bulbs, ranging in size from a wheat grain to a hazelnut, keep best in dry sand and should be sown next season like peas in drills in the garden. Some of the strongest are likely to bloom the second year and all should produce flowers the third. If seeds are sown under glass soon after ripening, in early October, according to foregoing directions, the bulbs may usually be ripened off in March, cured in sand in a dry warm place and planted out in May, thus securing a few blooms the following Autumn, one year after gathering the seed. Most of the bulbs thus treated should attain blooming size by the end of the first season. If only a few seeds of a rare variety are obtainable, very porous compost in five-inch pots or shallower boxes, the seeds sown near the edges, will give best results. The seedling gladiolus the first year is so slender and with such a small root system that considerable attention is needed to avoid excess moisture unless closely planted.

A useful modification of the above method is to replace the bottom of a box of convenient size with wire netting of one-half inch mesh or less, sink it to within an inch of the top in the soil in a convenient sunny place in garden, fill with prepared compost, sow seeds and proceed in the described manner except that less attention will be required in watering than if entirely exposed to the air. Box and soil can be lifted out when the bulbs mature, the soil dried and sifted to secure every minute bulb. If a considerable quantity of seed is to be sown a board frame eight inches deep, with bottom lined with one-half inch mesh netting, and sunk in the ground, will give complete security from moles and similar vermin. If ordinary poultry netting is stretched over the top, additional security against surface marauders is given. Hand hybridized seeds are too precious to risk in ordinary unprotected soil. Five thousand seedling bulbs may be grown in a frame 4x6 feet, if seeds are thickly enough sown.

CHAPTER IV.

Gladiolus Species.

The following list includes the most important *Gladiolus* species, as recognized by modern botanists. Many species formerly included in the genus *Gladiolus* are now correctly assigned to *Acidanthera*, *Antholyza*, *Babiana*, *Freesia*, *Montbretia*, *Tritona* and *Watsonia*. Most true *Gladiolus* species will hybridize together, under favorable opportunity, but all attempts to breed the above genera with *Gladiolus*, thus far, appear to have failed. The most important garden hybrids of *Gladiolus*, useful in breeding work, have been described in preceding chapters. An attempt is here made to note the height of each species, the season of bloom in the northern hemisphere, the native locality where known, and the approximate date of introduction to cultivation:

Gladiolus adlami, dull yellow with minute red spots,
Transvaal, 1889.

“ *alatus*, $\frac{3}{4}$ ft., scarlet, yellow, June, 1795.

“ “ *algoensis*, $\frac{3}{4}$ ft. Orange, July, 1824.

“ *albidus*, 1 ft., white, June, 1774.

“ *angustus*, 2 ft., yellow, June, 1756.

“ *atroviolaceus*, dark blue, purple, white, Palestine, 1889.

- Gladiolus* blandus, 1½ ft., flesh, June, 1774.
 " brachyandrus, 2 ft., scarlet, whitish, Zambesi Land, July, 1879.
 " brevifolius, 1½ ft., pink, June, 1802.
 " byzantinus, 2 ft., red, July, Turkey, 1629.
 " campanulatus, 1½ ft., light purple, May, 1794.
 " carneus, 2 ft., flesh, June, 1796.
 " caucasicus, Caucasus, 1842.
 " cochleatus, 1½ ft., white, red, March, 1829.
 " Colvillei, 1½ ft., bright red marked with pale purple. Hybrid.
 " Colvillei, alba, white.
 " communis, 2 ft., red, South Europe, 1596, July.
 " " albus, 2 ft., white, June, South Europe.
 " concolor, 1 ft., yellow, June, 1790.
 " Cooperi, 3 ft., red, yellow, September, Natal, 1862.
 " crispiflorus, various, July, 1842.
 " cruentus, blood red, white, September, Natal, 1868.
 " cuspidatus, 1½ ft., white, brown, May, 1795.
 " debilis, 1½ ft., white, May.
 " decoratus, 3 ft., scarlet, yellow, E. Africa, 1890.
 " dracocephalus, 2¼ ft., greenish yellow with purple lines, Natal, 1871.
 " Eckloni, 1 to 1½ ft., pinkish white, densely red spotted, Autumn, South Africa, 1862.
 " edulis, 1½ ft., white, June, 1816.
 " Elloni, white tipped with purple, 1890.
 " festivus, pale rose, July, 1844.
 " flexuosus, 1 ft., orange, June, 1825.
 " floribundus, 1 ft., citron, July, 1788.
 " Gandavensis, rich crimson, yellow, summer, hybrid.

- Gladiolus gracilis*, 2 ft., blue, white, April, 1800.
" *hastatus*, 1 ft., flesh, May, 1846.
" *hirsutus*, 1½ ft., pink, June, 1795.
" *hyalinus*, 1 ft., yellow, red, June, 1825.
" *imbricatus*, 1 ft., red, June, Russia, 1820.
" *involutus*, 1½ ft., pink, June, 1757.
" *Kirkii*, 3 ft., rose, Grahamstown, 1890.
" *Kotschyanus*, light violet, Afghanistan and Persia.
" *Leichtlini*, scarlet, yellow, Transvaal, 1889.
" *Mackinderii*, 2 ft., red or yellow, 1905.
" *Milleri*, 1½ ft., violet, May, 1751.
" *Mortoni*, 1½ ft., white, 1837.
" *namaquensis*, ¾ ft., orange, June, 1800.
" *natalensis*, 4 ft., scarlet, yellow, August, Natal River, 1830.
" *ochroleucus*, Transvaal.
" *oppositiflorus*, April, Madagascar, 1843.
" *papilio*, 2 ft., purple, yellow, South Africa, 1866.
" *permeabilis*, ¾ ft., orange, June, 1825.
" *primulinus*, Primrose-yellow, East Africa, 1890.
" *psittacinus*, 3 ft., scarlet, yellow, S. E. Africa.
" *pudibundus*, 3 ft., rose, hybrid (*G. blandus* x *G. Cardinalis*).
" *punctatus*, greenish-yellow, brownish-purple, 1889.
" *purpureo-auratus*, yellow, purple, Natal, 1872.
" *Quartinianus*, 4 ft., yellow and red.
" *recurvus*, 2 ft., striped, May, 1758.
" *Saundersii*, scarlet, white, August, S. Africa, 1871.
" *segetum*, 2 ft., purple, July, South Europe, 1596.

- Gladiolus sericeo-villosus*, 3 ft., yellow, S. Africa, 1864.
" *Salmoneus*, 2 ft., bright salmon.
" *tenellus*, $\frac{3}{4}$ ft., yellow, June, 1825.
" *tenuis*, 1 ft., red, June, Tauria, 1823.
" *trichonemifolius*, $1\frac{1}{2}$ ft., yellow, June, 1800.
" *trimaculatus*, 1 ft., red, white, June, 1794.
" *tristis*, 1 ft., brown, red, 1745.
" *turicensis*, Garden hybrid: *G. Gandavensis* x
 G. Saundersii.
" *undulatus*, 1 ft., pink, May, 1760.
" *versicolor*, $1\frac{1}{2}$ ft., brown, June, 1794.
" *vinulus*, creamy white, feathered with crimson, 1888.
" *viperatus*, $\frac{1}{2}$ ft., green, white, May, 1787.
" *watsonioides*, $1\frac{1}{2}$ ft., scarlet, Mt. Kilimanjaro, 1887.

ADDENDA

ADDENDA

Odd Notes From Many Sources.

Planting gladioli after potato or tomato crops is said to incur risk of scabby stock.

Peeled bulblets require a warmer soil than the unpeeled ones, and for this reason, May 15 to 20 is about the proper time for sowing.

It is conceded that second or even third size bulbs of Mrs. Francis King will throw a better flower spike than bulbs of a similar small size of most other kinds.

When the roots of the gladiolus have attained their full growth, the surface of the soil should be stirred but lightly, because of the danger of cutting the roots. Prior to that time, gladiolus bulbs will stand deeper cultivation.

One grower never plants gladioli the second time in succession on the same land. Dr. Van Fleet, the originator of Princeps, who distributed it through Vaughan's Seed Store, says that the variety should never be planted on recently manured land, but in a naturally deep, rich, alluvial soil.

One reliable grower keeps his black hard-shelled

bulblets in gunny sacks containing about one bushel mixed with about 20 per cent of fine dry earth. He has been quite successful in keeping the bulblets in this manner, and when so kept the shells do not harden to such an extent as to prevent sprouting of the kernel, as sometimes is the case when they dry out too much. This same grower believes in soaking the black hard-shelled bulblets for 36 hours in water just before planting, but no longer.

Gladiolus bulbs stored in bins should be turned every few days, especially after February, as this tends to prevent sprouting. They should not be kept in too warm and dry a place. It is best to keep them quite cool, the thermometer running as low as forty degrees Fahrenheit at times, and in an atmosphere of the ordinary cellar, which usually has some moisture. If they become troubled with green fly, sprinkle them with tobacco dust once a week.

Gladiolus bulbs stored in racks have been kept in good condition by close covering of double or triple thicknesses of newspapers, the bulbs being levelled off and the newspapers laid closely over the racks and kept close to the bulbs by loose strips of wood laid over them. Others have kept gladiolus bulbs in very good shape in old paper flour sacks, which contain half a bushel or three pecks of the bulbs (the bulbs being, of course, thoroughly dried out when tied in the bags). The natural moisture of

the bulbs seems, by some kind of paper protection as mentioned above, to be conserved, while full and continued exposure to dry air seems to provoke scab as well as hardening of the outer skin of the bulbs.

It requires a good sized bulb of America to throw a first class spike and second size bulbs produce, when forced, a considerably smaller spike than the first size bulbs. The America requires a longer growing season than most other gladioli and continues its growth well up to severe frosts. Growers who wish to harvest the largest possible number of first size bulbs allow these to grow as late as possible, and then leave the plants on their sides for 36 or 48 hours, during which time the sap from the stalks seems to go into the bulbs, making them more firm and putting them into better keeping condition for the winter. This latter suggestion probably applies to all gladioli and not alone to America, as it is practiced by a good many of the best growers.

Growers differ a good deal as to the depth of the planting and width of rows. One very successful Ohio grower plants his bulblets and small bulbs fully six inches deep and in rows only two feet apart, pressing the dirt down very firmly over the bulbs. Such deep planting, he claims, secures cooler soil for the working roots and insures a better crop in case of dry weather. The same grower in planting hard shelled bulblets sows one pint to about

three feet of row, making them very thick in the row, as he believes that the hard shelled bulblets, in germinating so close together, cause the hard shells of most of them to rot. There is convenience also in digging the crop which may be lifted in a mass. They also grow up so closely together in the row that they seem to choke out the weeds, thus saving hand labor.





